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EDITORIAL NOTES.

Centenary Celebrations.

WE are sometimes accused by those of our Continental friends who are not strictly admirers, of being a phlegmatic race, of taking our pleasures sadly, and of not making the most of our opportunities in this respect. They do not extend the accusation to industrial and commercial enterprise; and yet, forsooth, occasions do arise when they could with good reason charge us with letting opportunity glide by for obtaining commercial benefit. We stand, for example, somewhat abashed, in the land of the nativity of gas manufacture and its application, as we read the columns upon columns of contribution that have reached us from Philadelphia in connection with the celebration of the centenary of the London Chartered Gas Company, held in that city under the joint auspices of the American Philosophical Society, the Franklin Institute, the American Chemical Society, and the American Gas Institute. The compliment is highly appreciated in the mother country. But we have to confess that the British gas industry have passively allowed the centenary of the application of gas, and now of the centenary of statutory gas enterprise to slip by unobserved in any prominent manner. If France, Germany, or America, had had the same association with the early history of gas manufacture and application as this country had, the gas industry of the country concerned would have made cities and towns ring with its celebrations of the anniversaries; and the opportunity for commercial advantage from the advertisement, by the use of good publicity megaphones, would certainly have been grasped in the most energetic fashion.

In the opening years of last century, those who laid so well and truly the foundations of the gas industry were actively at work in this country; and in April, 1812, the Charter of the Gaslight and Coke Company (known for years as the Chartered Gas Company) was granted. But here we have barely given a thought to the incidents surrounding the birth of the industry, much less commemorated those events. We have not told the world that we have reached and passed our century; neither have we told the world anything of the vast progress of the gas industry, of the marvellous position that it occupies in the world's affairs, and of the ramifications of its products in our domestic and industrial life. The occasions have passed. Opportunities have admittedly been lost. The British gas industry is, however, very matter of fact. In these times it always appears too busy, though there may be profit in it, to look back. On every side, hands are full of work—technical, commercial, and legislative claims press. Progress, the world's requirements, the advances of competitors with which we must keep well abreast, the pressure of competitors in their anxious essays at putting fresh encumbrances on the industry to retard further advance in one or other direction, are all claiming consideration and attention, which absorb time. But, withal, we feel that we cannot, with these celebrations before us in Philadelphia, altogether excuse the utter neglect of the commemoration of events that have made such large impress upon the world's domestic, public, and industrial affairs, and has contributed so considerably to the brightness, the conveniences, and the economies of human existence. The neglect seems to imply want of appreciation of those who laboured a century ago, and supplied the initial stages of the industry with which all associated with it, with its prosperity, and with its promise, deem themselves honoured.

As we read through the contributions to the Philadelphia commemoration proceedings, and find portrayed therein the development and extensiveness of the gas industry, in all directions—financial, technical, commercial, and in its applications—the thought passes across the mind that the pioneers of all this (we see it when we examine into their conceptions of what would suffice to meet requirements) had no notion whatever that the measure of things would be as it now actually is a hundred years after the spade-work of their day. To bring it to the present position, however, has meant hard work and deep thinking. It is singular perhaps to some, but not to others, that during the past thirty years or so, which mark the period in the life of the industry when competition has been the keenest, the progress in volume of business has been greater than at any other part of the century, and it has been during this last tri-decadal period that the hardest work and the deepest thinking have been applied to the development of the industry's interests. The development has not been due to any one thing; it have been due to an agglomeration of things which include the application of science on every side of the industry in connection with gas manufacture, residuals treatment, and gas applications. The developments in manufacture have had their bearing on applications; and applications on manufacture. Herein there is an extraordinary tale of an uninterrupted growth of efficiency and a supersession of defects, and of the mutuality of the factors in the industry's growth.

The history, indeed, of our industrial affairs is one that is good to look upon. But in the building-up of this history of progress and success, there has been no exclusiveness or selfishness on the part of the gas industry. Never perhaps has there been any other industry that has scattered benefits more widely afield than the gas industry. Its requirements give a growing amount of work to several producing, manufacturing, and transport industries; its prime commodity plays many parts in other industries where light, heat, and power are required; its residuals, and the products of these residuals, yield work and effects the ultimate ends of which it is difficult to trace. Looking at all these things, we see that, as a constructive industry, as a money-producing industry for talent, enterprise, and labour both within and beyond itself, it stands in the front rank in the world's affairs. It has made itself so universally necessary, it has endowed the world with so much benefit which cannot be dispensed with, that it cannot be disestablished. It continues to make for itself fresh vantage-ground; and looking forward from the standpoint of the Philadelphian celebrations, we agree with the views so freely expressed there that great as has been the expansion of the industry during the past century, the work that it has to do in the world will be greater still in the century along the highway of which we are now marching.

The Institution Meeting.

A FORTNIGHT to-day the members of the Institution of Gas Engineers will be assembled in London, under the presidency of Mr. Robert G. Shadbolt, intent upon their annual meeting. The business proceedings will be held on this occasion at the Royal United Service Institution, Whitehall. The full programme has been issued; and it foreshadows a considerable amount of interest for the week, though there is no indication of any highly controversial subject, or anything novel relating to the processes of gas manufacture or application coming before the meeting. But new processes or applications or controversial subjects at a meeting of this kind are no positive measure of the profitableness of the meeting to the members.

We have previously noticed the technical programme, and mentioned the Presidential Address. In the report of the Council (extracts from which are published in other columns, and which will be referred to editorially next week) several technical subjects are treated upon in reports and otherwise; and it will be quite open for any member to raise points upon the subjects at the meeting at the time the report is presented for adoption. The Carbonization Committee have nothing fresh to announce, though the members of the Committee show they are possessed of an inextinguishable hope of being able at some time or other to present a report which will really justify their appointment and existence. The Refractory Materials

Research Committee have gone forward with their work; and it may be anticipated they have again earned credit for their additional achievements. This report will form part of the technical proceedings. There is to be a joint conference of the Commercial Gas Sections of the United Kingdom on Tuesday afternoon. The fixed items on the social side of the programme for the week include a reception by the President and Mrs. Shadbolt on the Thursday evening—the reception to be followed by a dance. The scene of this event will be the Connaught Rooms, Great Queen Street; and this will be a change from the *locale* of similar predecessors on the occasions of London meetings. The excursion on Friday will be (very appropriately, in view of the President's connection with the Eastern Counties) to Cambridge. The day promises to be one of great interest. The Colleges, University Laboratories, and the works of the Gas Company are embraced by the itinerary; and the visit will conclude at the Guildhall, where the Chairman and Directors of the Gas Company will be the hosts at tea. Everything points to the realization of the anticipation of a successful and profitable meeting.

The year has been one that has made extraordinary claims upon the President, what with the ordinary business of the Institution, the launching of the British Commercial Association, the meetings over the question of the allowance for depreciation in respect of income-tax, the necessity for immediate movement in the matter of the chemical manufacturers' assault on the liberties of the gas industry, and the preparations for the jubilee year of the Institution. Mr. Shadbolt, however, through it all, has, with characteristic vigour, put his shoulder to the wheel, and has worked earnestly and hard in the interests of the industry generally, and of the Institution in particular. His energy and conscientiousness in the discharge of duty behind the scenes deserve the reward of a full and successful meeting a fortnight hence.

Tyranny and Goodwill.

In the "Contemporary Review" for this month, Mr. Theodore Cooke Taylor writes philosophically on the subject of "Profit-Sharing and Co-partnership," of which he has been a student for thirty years, and has practised in his woollen manufacturing firm for the past twenty years. There are many striking passages in Mr. Taylor's article, of which, however, for the moment, we only desire to refer to two. He says, and says truly, that the argument grows in favour of some change from the last resort of the strike or the lock-out; and he remarks further: "We move in a mis-"chevious circle—war breeds war; strikes and lock-outs "breed enmity and poverty; poverty and enmity, strikes "and lock-outs again." Unfortunately, this is all true; and unfortunately, too, further illustration was supplied last week of the vigorously cumulative power of the argument in these times. The change Mr. Taylor has set his heart upon, and the progress of which we have endeavoured to foster, is the one the efficacy of which he has proved, and that is co-partnership. But a new phase in connection with the question of co-partnership is before us. Where co-partnership is established, the militant trade unionist leaders are confessedly powerless; and where it is introduced, they see their power on the wane, and a new light among the union-subscribing rank-and-file which reveals to them the union as, in the new circumstances, a sort of superfluity. These effects could not fail to escape the notice of the militant unionist leaders; and they are now trying their utmost to stop the inroads upon their power and finances of this modern influence. The present trend of the policy and strategy of trade unionism, however, is bringing co-partnership into greater prominence as a means of re-establishing correct and dignified relations between employers and employed.

The modern trade union leader is a despot of the worst order. Before the country has recovered itself from the coal trouble, London receives another blow from a strike of the workers in the Port of London, the origin of which was simply the refusal of one man, exercising his freedom and will, to join the Transport Workers' Federation. This has been made the excuse for ordering 100,000 men to cease work to rectify—rectify according to unionist notions—other grievances. But in announcing the decision to call a strike, Mr. Harry Gosling, the President of the National Transport Workers' Federation, stated that "the first item on the pro-"gramme is that we are not going to work with non-union "men." This is sheer tyranny. It is an attempt to take away from men who are not of a like way of thinking the right to exercise their free will, and to make them the slaves of the trade unions. Such despotic action (we have had it before in trade disputes, we are having it more frequently now) is intended to render still stronger the control of national interests by the trade unions; and if this is not a good argument in favour of a change, then we have to confess we do not know of a stronger one. "It is vital to us," added Mr. Gosling, "to "stand by our unionism, and to maintain our unions at their "fighting strength." Thus these so-called "leaders" only see, and only care to recognize, their own war-machine as an effective means of securing improved conditions for the worker. We know, with the "revolutionary successes" (to use a favourite term of a socialist leader) of co-partnership before us, that they are wrong. The system has proved itself the strongest of all in producing material effects for workers. The Industrial Council, and Conciliation and Arbitration Boards are all (we have had an ample demonstration of this) impotent against the new strategy of trade unionism. The trades unionists only ridicule such plans, and reject their findings if they do not give expression to their requirements. No one can envy Sir Edward Clarke, K.C., in the inquiry he has been appointed to make into the present alleged grievances of the transport workers on the Thames and the Medway. We much fear that the result will not be as most men would wish. The trade unionist leaders have greater reliance upon the potency of their new policy, which has displaced the local strike by something of a far-reaching character, and which makes the whole community unwilling parties to the differences between sections of labour and their employers by extending the area of disaffection and interruption of work, and so imposing suffering upon the public in respect of a cause in which it has not the slightest concern. We have this trouble on the Thames between union and non-union labour. Fifteen unions are quickly involved in it; and at a few hours' notice, 100,000 men are idle. The threat is issued that the whole transport workers of the country shall be called out if there is not a settlement; and that an endeavour will be made to induce the railway men to follow. For what purpose? To give, in the first place, the trade unionists working in the Port of London the right to say that non-unionists shall be deprived of their freedom of will and right to work. Words fail to properly describe such tyrannical action.

This extension of the policy of militant trade unionism, which spreads and increases the disorganization and depreciation of national and personal interests, will do more, in our belief, to defeat its own ends than anything else could possibly do, by hastening the change-over to co-partnership. This or some such system is bound to come into direct conflict with the new policy of the extreme unionist leaders; and it will be a fight for supremacy between the one and the other. But the initiative must be taken by the masters; and to them Mr. Theodore Taylor addresses himself in the "Contemporary Review." He raises the question well above the sordid view of self-interest. The employers—no matter the nature of their commerce or industry—have appeal made to them from many sides in this one article. The trading of the manufacturer or of any business man depends upon the goodwill of the general community. Employers should therefore regard it as their duty to study the interests of the general community upon the members of which their business depends. If they do this, they will find that their duty embraces the obligation to do their utmost in any reasonable way to have their relations with their employees of a nature that will prevent interruption of the service to those from whom their profit is made. There is business "goodwill" in this which is an asset with a money value equal in every respect to the "goodwill" that attached to a business, and for which payment had to be made on transfer, before such a thing as co-partnership came upon the labour platform in the way that Sir George Livesey and others have brought it there. The matter of co-partnership is surely worth consideration from this point of view alone; it is worth consideration, Mr. Taylor tells us from his experience, from the point of view of the goodwill of the employees themselves. This goodwill has also to the employer a money value, if not strictly definable; and this goodwill can best be restored, it has been proved, by a personal interest in the business. Employers are needed everywhere who will take up and introduce co-partnership as the best movement available for effectually checking the new destructive policy—a policy wholly destructive of national interests—of militant unionism.

Mr. Taylor pleads for a new conception of patriotism on the part of both employers and employees; and for the spread of a system that dignifies and raises the character of our business life. The need for this has been stalking about us in ghastly menacing form more than ever this year.

Standardization of Gas-Burners.

Only the other day, we had Mr. Jacques Abady, in his North of England Gas Association lecture, telling us of the advantages that modern incandescent gas-lighting enjoys in the matter of the quality of the light, the low (compared with electrical sources of light) intrinsic brilliancy, the good ventilating properties, and the excellence of the lower hemispherical illumination using inverted burners. Now we have Mr. Van Rensselaer Lansingh, at the recent American celebration of the centenary of gas enterprise, saying: "We "can safely state that, with the improvements which have "already been made, it is possible with gas to duplicate "nearly all the effects which can be obtained with electric "lighting, as regards ornamentation, distribution, ease of "control, &c., and even surpass it in cheapness of operation." Yet Mr. Lansingh is not satisfied. He pleads, among other matters, for the standardization of gas-lamps similar to the methods of standardization of electric incandescent lamps. What seems to be in his mind as an important requirement is more reliable methods of commercially rating gas-lamps; so that, whenever specifications are drawn up by the illuminating engineer or the architect, giving certain definite illumination requirements, he can be reasonably sure of obtaining exactly what he wishes. We sympathize somewhat with Mr. Lansingh's aspirations; but, if the position of the standardization and rating of electric lamps is in America anything like what exists in this country, then we are afraid that we must be excused from desiring that gas-lamps should be so standardized and rated that they are a misrepresentation of actual values. Electric lamps were here hauled before a Committee on Trade Misrepresentation not long since as excellent illustrations of the subject into which inquiry was being made. Electric lamps are sold as of a certain candle power, and as having an efficiency (say) of 1·1 watts per candle. It is found that they give a lower illuminating power on the voltage for which they are designed, and the duty is frequently in the region of 1·5 and not 1·1 watts per candle power. Flame arc lamps, too, have nominal candle-power distinctions in this country which show that the tensile strain to which imagination can be subjected is unlimited. If this is the sort of standardization and rating that Mr. Lansingh advocates for gas-lamps, then the gas industry can well do without it.

As a matter of fact, we are not altogether clear as to what our friend really requires in this way, though it is plain that it might be useful if (for example) in the case of a medium-sized inverted burner, giving an illuminating power of 50 candles, a statement was made as to whether this was the horizontal candle power, or the mean lower hemispherical candle power, together with the quality, pressure, and specific gravity of the gas with which the test was made upon which the maker of the lamp bases his claim. But this would not be of much use to any but technical men. Of course, burners can be specially designed for a particular quality and pressure of gas, as has been demonstrated by the "Metro" burner. But with a burner fitted with a good regulator, the candle power claimed by the makers can, by adjustment to local supply conditions, be approximately obtained, if the supply conditions themselves be maintained during lighting hours approximately uniformly day by day. Apart from the supply conditions (which in some districts perhaps want standardizing more than the lamps), the incandescent gas-lamp possesses within itself a wide range of adjustment to varied local conditions such as the electric lamp, no matter the kind, does not possess. Perhaps the supply conditions in America, variable as they are between the cities in respect of the constitution of the gas, have impressed on Mr. Lansingh the necessity for the standardization and rating of gas-lamps more than they have done us in the mother country.

Mr. Lansingh also laments the absence of a good range of burners of different candle powers to match the range of electric lamps of the electricity supply industry. There, again, we do not find at home anything to complain of, seeing that hands can be placed on modern gas-burners for all purposes ranging from a vertical one consuming a little over ½ cubic foot per hour or from an inverted burner consuming 1 cubic foot per hour, up to a 4500-candle power high-pressure inverted gas-lamp, with innumerable intermediaries in the matter of size. However, the paper is one cleverly framed to give a comprehensiveness of survey of the advances of illumination with gas supplying the light-producing energy. Variations in conditions of practice promote fresh thought and ideas; and Mr. Lansingh's paper supplies us with both. It may be that investigation of gas supply conditions in America may transfer some of the argument for standardization of lamps over to the gas service; and it may be that comparison of lamp production in America and over here may also have its lessons. We cannot tell. The suggestion is as far as we go.

Limiting Rate Aids.

If Parliament confirms the Salford Provisional Order, the last proposal that the Corporation made to the outside authorities, regarding the amount to be appropriated from the gas profits in aid of the borough rates, to get free from the *impasse* in which they found themselves by the circumstances started by Lord Donoughmore's Committee, and completed by the promotion of a Bill by the authorities in the area of Salford gas supply outside the borough, will be the one that will take effect. Salford, it will be remembered, fought very hard first to retain the old freedom in the matter of the appropriation of gas profit. Failing that, and seeing limitation staring them in the face, they tried to get much higher terms—£15,000 and £2500 on the proposed additional capital—than the bare 1 per cent. on the outstanding capital which the Lords Committee suggested; and, failing that, at the Local Government Board inquiry they offered practically the terms which the Board have endorsed, and which were quoted in our "Miscellaneous News" last week.

The most important item is the payment of a fixed £10,000 a year from the gas profits to the borough fund. This compares with £18,000 last year, and the £18,000 proposed for this year. But for the ten years preceding 1909—the year when the decision of Lord Donoughmore's Committee came upon the Salford Corporation like a bolt from the blue—the average was some thousands higher than this. Then there is a further £2089 that may be taken to the credit of the borough fund, until the loan to which the sum refers has been paid off. A reserve fund for the gas undertaking up to a maximum of £70,000 may be maintained by not exceeding £7000 appropriations annually. Profit appropriation, though limited, carries with it the right to the outside districts to charges for gas for both public and private purposes uniform with those inside the borough—that is to say, uniform so far as purpose goes. The gas consumers in Salford might have been far better off without profit appropriation in aid of the rates, and a differential price for the out-districts, than by having a share of relief of rates from the £10,000. But Salford had to pay something to the outside authorities for the right of taking from them (as well as the gas-consuming part of the Salford ratepayers) money to be devoted generally to the borough fund, which properly should be financed by all the ratepayers in the regularized way. The consumers in the whole supply area will now have the gratification of knowing that any surplus profits, after the claims as determined have been satisfied, will have to be devoted to a reduction of the price of gas; and henceforward Salford ratepayers must always pay in due proportion for the public lighting of the borough, as otherwise the outside authorities will have the right to get their public lighting free. Of course, if at any time the revenue of the undertaking is short of the sum required to meet its obligations as now defined, the necessary amount can be taken from the reserve fund, or be borrowed from the rates, and the debt repaid. Such a contingency, however, is anything but an immediate one.

Whether there will be any revision of these terms when the Provisional Order gets before Parliament—in which the Salford Corporation, in getting the best terms possible for themselves, had apparently not such confidence as they had in the Local Government Board—remains to be seen. Lord Donoughmore is now Lord Chairman of Committees; and when the Order is before him, and he learns the nature of the profit-appropriation scheme, he will have recollections of the bad shock he gave Salford three years ago. He will also see that the appropriation is considerably in excess of the terms which his Committee of that day proposed—*i.e.*, 1 per cent. on the outstanding capital. The total amount Salford has borrowed for its gas undertaking (according to the last-issued

Board of Trade returns) is £965,705; and loans repaid and sinking fund total to £380,802. Therefore the outstanding capital is £584,904; and 1 per cent. on this would be £5849, instead of the £10,000 and the £2083. The difference is considerable. As we have said before, the defining of lump sums in this way means a perpetual fixed payment; but there ought to be some basis (if there is not to be total suppression of profit appropriation) for the limitation of the amount transferred to the rates, in order to get uniformity of practice in this regard as time passes, and as restriction is made compulsory by Parliament. The 1 per cent. on the outstanding capital was not unfair; and this would have formed an excellent rule for the application of the principle. Without some such rule, there will be perpetual fighting to get as big lump sums as possible by profit-bagging local authorities.

The Stratford-on-Avon Explosion.

From the gas-engineering point of view, the explosion at the Stratford-on-Avon Gas-Works has been satisfactorily cleared up. Technically, the point upon which knowledge was required was the originating cause. How the explosive mixture brought about by the escaping gas became ignited can now only be a matter of conjecture; and this and the direct consequences of the explosion (though highly regrettable) take secondary place to the ascertaining of the origin, so that the information may be used in the cause of the prevention of a similar occurrence, and the protection of life. After the evidence at the inquest, there is no question that the meter overflow-syphon was imperfectly constructed, in that there had not been allowed a sufficient margin to resist any abnormal pressure that might be thrown upon the water in the syphon—in fact, Mr. G. Winstanley, the Gas Committee's expert, who first located this weakness, marvelled that, when the syphon had normally run out, the water remaining would stand even the 6 or 6½ inches pressure, which was the ordinary pressure on the meter-overflow when the gasholder cupped. Mr. Fletcher W. Stevenson fully confirmed Mr. Winstanley; and tests made separately and jointly supplied all the proof that was necessary, that the syphon seal was not adequate to withstanding any sudden or abnormal increase of pressure without becoming broken. The same syphon was in existence on the occasion of a previous explosion, but the absence of a proper margin of safety in it was not then suspected, and the cause of the escape on that occasion remained undetermined. There is this time no question on the expert evidence as to the proper location of the seat of the gas escape that brought in its train such dire consequences. The lesson will be heeded in the gas industry; and the overflow syphons of station meters will be examined with the view of ascertaining that they are capable of withstanding all likely pressures that may, under existing conditions, be thrown upon them. There is one other point. One of the deceased men, the evidence and the Coroner's remarks showed, was not always so temperate as is desirable on a gas-works. Discipline, in the absence of a responsible chief, is important to safety; and such men are a menace to safety when the back of the engineer and manager is turned. Whether any act of the man in question had anything to do with the ignition of the gas, no one can now say. The losses occasioned by the explosion are irretrievable; but the cause of the occurrence has been found, and that is a technical gain. Mr. J. S. Cranmer, the Manager of the works, has the deepest sympathy of his professional brethren in the worry and anxiety that the explosion, sacrifice of life, damage to property, and dislocation of work have occasioned him.

The Beginning of the End?

This is a heading to a paragraph by "Meteor" in the current issue of the "Electrical Times." The note of interrogation at the end of the heading indicates that our friend is more than doubtful as to the applicability of the title to what follows. He has a very unhappy failing of misconstruing most things referring to the gas industry, or professing that his knowledge is not equal to proper and fair appreciation. In this instance, he says: "If the outlook for gas was never more rosy than it is at present, if dividends were never fatter and enterprise never more hearty, how is it that our financial contemporaries publish such paragraphs as these: 'Few things in recent joint-stock history are more significant than the misfortune which dogs the footsteps of new gas companies. The last two or three years have witnessed a long and melancholy procession of disasters in this department.' The new gas publicity organization should communicate at once with the editor." If "Meteor" had been up-to-date with his study of financial papers, and had noted all that had preceded the lines which he quotes, or if he had taken the trouble to consult the files of the "JOURNAL," he would have known something of the operations of the promoting gangs, headed respectively by Eaton, Preston, and Darby, who, trading on the good reputation of the gas industry among investors, purchased liliputian concerns in the Provinces for a thousand or two, and launched them on the public for several thousand pounds. The results were those expected by competent judges—a financial condition equalled only by many small electrical undertakings run by local authorities. But as these grotesquely over-capitalized gas concerns had not the local rates upon which to fall back, the services of an official receiver has been required in nearly every case. "Meteor" is quite at liberty to reproduce this paragraph *in extenso* in his next budget of notes, as well as the references in our "Electric Supply Memoranda" to the Nottingham explosion.

Labour at Leicester.

A somewhat unusual situation arose at Leicester some days ago, when the Gas Committee brought forward at a meeting of the Town Council a recommendation that an installation of Glover-West continuous vertical retorts should be put up at the Belgrave Gate works. A large annual monetary saving was estimated as the result of the adoption of the system; but one thing apparently stood in the way. Some two or three years ago, the Council passed a resolution intimating to each Committee that no labour-saving machinery would be sanctioned until alternative employment could be found by the Council for the labour displaced. The installing of vertical retorts would, of course, result in a lessening of the amount of labour required; and the Gas Committee therefore recommended that this general resolution of the Council should be rescinded. "They were," it was said, "advised that, while this resolution stood on the minutes, it blocked the way to the introduction of all up-to-date labour-saving methods and appliances necessary to progress. It was a relic of by-gone times; and in this age no sane person, worker or capitalist, could reasonably hope to stop progress by opposing the introduction of scientific methods designed to improve modern industrial and commercial conditions." This was a fair statement of the matter; but though an assurance was given on behalf of the Gas Committee that every effort should be made to provide other work for the men affected, strong opposition was raised by a section of the Council to rescinding the resolution, and ultimately the portion of the report containing this recommendation was taken back by the Gas Committee, pending the holding of a special meeting of the Council. The situation seems to be one that should be easily capable of adjustment—especially in view of the strong inducement held out by the large economies foreshadowed by the adoption of vertical retorts.

The Coal Position.

There has been no change in the coal position, though discontent reigns in certain of the coal-fields, especially in South Wales, over the minimum rates of pay fixed by the Joint District Boards. The Miners' Federation Conference has not resulted in a proposal for any drastic measures. There seems to be a disposition to treat the matter with moderation, and to try the effect of peaceful persuasion with the Government before making any further move. In some districts the minima fixed are perfectly satisfactory to the men; in others, they are not. The Federation have called upon the Government to intervene; and to bring about some redress of grievances by amending the Coal Miners' Minimum Wages Act. This points to pressure being brought to bear upon the Government to introduce figures below which minimum rates must not go. But the resolute attitude of the Government when the Bill was under consideration does not give ground for any hope that they will depart from the determination then arrived at.

Mr. J. C. HAWKINS, Engineer of the Paignton Water-Works, has been appointed Engineer under the Irrigation Department of the South African Government, and has resigned his position at Paignton. Mr. Hawkins was trained under Mr. W. Ingham, a former Engineer of the Torquay Water-Works, and went with Mr. Ingham to South Africa in connection with the construction of the Port Elizabeth Water-Works.

NOTES FROM WESTMINSTER.

The Blocked Bill. THE South Suburban Amalgamation Bill has not yet been read a second time in the House of Commons. It has been postponed on the blocking motion of Mr. Rowlands; but we believe that the Chairman of Committees (Mr. Whitley) will see that there is not any undue delay in having the motion discussed, if discussion there is to be. A day early after the House reassembles is named for the purpose; but that is no guarantee there will not be a further postponement. Mr. Rowlands' stated object in blocking the Bill is to attempt to squeeze from the promoters further concession as to the price of gas for the West Kent area; but there is no doubt the promoters (who have dealt very reasonably with all the areas concerned, and have conferred upon them prices that they could not possibly have secured so early by the retention of the existing conditions) will stand firm in this matter. They have the respective interests of the various districts to consider, in relation to present conditions; and these interests have been examined by the Upper House, and the terms approved as they stand to-day in the Bill. Whether at the back of Mr. Rowlands' motion there also lurks any of the antagonism of the extreme labour members to the expansion of co-partnership is not known. We hope not. However, the matter has now to rest for developments.

A Withdrawal. It will be remembered that an agreement was arrived at, and endorsed by the Commons Committee who considered the Bognor Gas Company's Electricity Bill, whereby that measure goes forward in preference to the Provisional Order that Mr. Tate promoted for providing an electric supply for the town. Mr. Tate has already a private plant, which supplies the theatre and adjacent property of which he is the owner. Part of the agreement was for the sale of Mr. Tate's plant to the Gas Company, and agreed terms for the supply of energy to him and his present customers who are his tenants. But it seems there was some misunderstanding. Mr. Tate was under the impression his plant was going to be purchased as a going concern; and therefore Counsel on his behalf appeared again before the Committee, and expressed the desire of Mr. Tate to retain his property, and continue supplying as at present. The Gas Company under the circumstances had no strong opposition to offer to this course. Their Bill proceeds; Mr. Tate's Provisional Order is dropped; and from what Mr. Balfour Browne, K.C., said on behalf of the Gas Company, and the reply Mr. Vesey Knox, K.C., made, Mr. Tate will not offer any opposition to the Company's Bill in the Upper House. Before Parliament adjourned for the Whitsun recess, the Bill had passed through all stages in the Commons.

ELECTRICITY SUPPLY MEMORANDA.

Electricity the Culprit at Nottingham—A Heavy Bill of Claims—Flame Arcs and High-Pressure Gas-Lamps—Eye-Rest Fittings for Baneful Lights—Electric Lighting and Depression.

TOWARDS the end of November last, there was a disastrous explosion at Nottingham, which practically ruined the Albert Hotel, and did an amount of personal damage. At the time, the strongest suspicion attached to the gas that uplifted things having been generated by the electric cable that passed over the tops of the vaults of the Albert Hotel. Notwithstanding this strong suspicion, certain of the daily papers, illustrated and otherwise, persisted in referring to it as an explosion produced by coal gas that had wandered on evil intent from the course destined for it. Under circumstances pointing so strongly to electricity as the culprit, it was not conspicuously honest of the "Electrician" at the time to publish in its "Commercial Supplement" a photograph of the wrecked Albert Hotel, and over the illustration to put the words "Playful Gas," and under it the words "Not Due to the Fusing of an Electric Wire." If the "Electrician" desires to show a capacity for fair play—in this matter, if not in all others—it will republish that photograph with the words at the top "Playful Electrically-Generated Gas;" and at the bottom, "Due to the Fusing of an Electric Cable." As "Meteor" of the "Electrical Times" also displays an exceedingly great joy over photographs of gas explosions, while he passes with stern disapproval the publication of any photographs referring to disasters caused electrically, he might make an exception in this case, just to show an ability for breaking-away from what has appeared to be his inveterate rule of action. No doubt the "Electrician" will be pleased to lend him (after it has republished it) the block from which it produced the illustration of the disfigured and mutilated Albert Hotel, at we think, the end of December, or early in January last.

Our contemporaries cannot want any more proof of the real cause of the explosion than the admission of the Nottingham Corporation Electricity Department that the explosion was occasioned by gas generated by the fusing of the electric cable, and which gas found its way into the cellars and basement of the hotel. The Committee have had to part company with several thousand pounds in the shape of compensation. The claims met amounted to nearly £5000; and they have also a standing monument in the shape of a £52 annuity to the Assistant Manageress of the hotel for the bodily harm occasioned to her. In addition to this, and as a result of the explosion, an elaborate system of ventilating boxes is being installed throughout the electricity distribution system of the city; so that the Electricity Department has good cause to remember this particular happening. Very certain is it that its officials will not be in any hurry, should a similar unfortunate event occur in the city in future, to ascribe it to gas from the town-gas mains, until they are fairly sure it is so. There is no question about it that many of the explosions that occurred in the earlier years of electricity distribution, and until a few years ago—which were invariably attributed to coal gas getting into electric culverts and street-boxes, and there coming in contact with faulty electric cables, causing by the combination of circumstances rather startling effects—were really produced by gas generated by the fusion of electric cables. The gas industry in those days often paid up, and looked cheerful over the matter; but the gas industry examines a little more narrowly into the circumstances to-day. If it did not, perhaps it would have had to pay for such events as the Long Acre cable fusion and the jeopardizing of several lives by poisonous fumes, and the more recent Strand and Nottingham explosions.

We rather frequently come across in electrical discussion those pious gentlemen who thank goodness that they are not as other men, and who take unto themselves, without any particular qualification, the right to pass judgment on those other men. Allusion was made by us a fortnight since to a paper read by Mr. M. Solomon before the Birmingham Section of the Institution of Electrical Engineers. It is seen that in the discussion, Mr. W. E. Milns spoke of the "misstatements of candle power *usually* given [? made] by the manufacturers of high-pressure gas-lamps"—that is to say, that the manufacturers of high-pressure gas-lamps are so depraved that, in Mr. Milns' opinion, they are habitually making statements that are untrue in regard to this matter. Turning back a little way in Mr. Milns' speech, we observe that he refers to an experiment that is being made with ten 7-ampere magazine flame arc lamps, five in series, on 220 volts, in competition with ten "twin-mantle" Keith-Blackman high-pressure gas-lamps. Now he states that the "approximate" maximum illuminating power from the arc lamps totals to 16,400 candles. We should much like Mr. Milns to tell us whose lamps these 7-ampere ones are; and by what means and in what manner he has tested them, or whether he has accepted the makers' statements as to illuminating power. It is remarked that the figures he gives work out to 5 candles per watt; but we have never come across actual tests by independent men that have reached such a permanent high efficiency for a 7-ampere flame arc lamp. Then we come to the ten twin-mantle high-pressure Keith lamps; and this person who charges high-pressure gas-lamp makers with a want of veracity in stating their figures, asserts that these ten twin-mantle lamps will not give more than 6600 candles for a consumption of 170 cubic feet per hour. This is only equal to a duty of 39 candles per cubic foot—each lamp only giving a light of 660 candles, and each mantle only 330 candles. Is Mr. Milns really serious? Has he himself carried out these tests? If so, with what photometrical apparatus? If the figures are true, then the lamps are not the modern Keith inverted, nor the pressures the modern pressures. The City Engineer of Westminster (Mr. W. J. Bradley) has more than once testified that in all cases the high-pressure street gas-lamps in the City of Westminster have given more on his tests than the contract quantity of light. Some explanation should certainly be made by Mr. Milns, who so glibly accuses other people of untruth. However, on the figures that he advances, which we cannot make to square with other tests and other and long experience, he thinks that the flame arc lamp can compete in cost with the high-pressure lamp.

But there are matters that the user of these lamps have to consider other than a comparative wire-drawn statement of running costs. Mr. Milns himself referred to some points of importance for the consideration of the consumer. He said [quoting from the "Electrician"] the flame arc lamp had the following drawbacks: "(1) Its first cost was much higher than that of the high-pressure gas-lamp; (2) it was usually necessary to burn four or five lamps in series to secure the greatest economy; (3) although assured by Mr. Solomon that carbon makers, and not lamp makers, were responsible for the development and efficiency of flame lamps, the lamps became obsolete after two or three seasons' use. These drawbacks accounted for the growing use of high-pressure gas-lamps. While not under-rating the question of quality in carbons, the question of quality in the lamp was most important. All flame arcs had not satisfactory mechanism, nor was the mechanism always adequately protected. The user of the lamp did not always appreciate the importance of the type of globe, carbon tray, dioptric or other inner globe or reflector." These are questions of importance; so are the steadiness, quality, and colour of the light of the high-pressure gas-lamp in comparison with the flame arc lamp. So, too, is the fact that the shopkeeper is not called upon to have four or five high-pressure gas-lamps in series where one or two will suffice; nor is he called upon to blind pedestrians and inspectors of the goods in his windows by having an excess of light in order to average-out to a fairly reasonable price the cost of 1000 candle-hours. The main thing, however, that we object to about Mr. Milns' remarks is the insinuation as to almost perpetual falsehood on the part of high-pressure gas-lamp makers—including, it follows, the firm of James Keith and Blackman, Limited, whose lamp he specially mentioned. Yet have not professors complained of their inability to get proper illuminating power readings from flame arcs because of their inconstancy; and have not professors warned us against accepting the nominal

candle powers of flame arc lamps that are apparently given more for the purpose of designation than as a description of value? The practice is very misleading and confusing.

The electrical industry is taking to heart more seriously than ever the baneful effects upon human vision of modern electric lamps. It is a matter of necessity; and necessity is the mother of invention, and the invention in this case discounts the economy of present-day electric lamps compared with their electrical predecessors. The public, it is found, are complaining of the mischief to their eyes. Even the club habitue writes to the papers bemoaning the fact that he cannot read at the club without having his eyes strained and tormented to a degree that is not good for them, nor creditable to the English language. There must be reform in electric lighting. "A.B.C." contributes an article to the "Electrical Times," in which he advocates the "Eye-Rest" system of indirect lighting, which the more it is talked about by its proper name, the more it advertises one of the gravest defects of electric lighting. In this system, "scientifically designed" inverted bowls, with X-ray reflectors, are used; and the light is reflected from the ceiling. The X-ray reflectors are said to do for indirect lighting what the Holophane globe does for direct lighting—it produces even distribution of light, without the eye being exposed to the intrinsic brilliancy of the filaments; and thus the day is prolonged when the eyes become so wrecked that they have to be accommodated with spectacles. "A.B.C." does not deal with the cost of this system of lighting. We all know that reflected lighting from ceilings needs greater expenditure of energy than direct lighting; and this, the greater number of lamps required, and the "Eye-Rest" fittings, all mean much additional expense to consumers. These are factors contributing to making electricity dearer for the householder, who, probably for no other reason than a desire for something novel in the home, changed from gas to electric lighting. With his house already fitted up for direct lighting, unless he is a rich man he cannot afford to have it converted to such a system as indirect lighting. If, too, the "Eye-Rest" system is necessary for the hotel, the club, the theatre, the millionaire, what about the few poor householders who have taken on electric lighting by means of metallic filament lamps under the fixed-price system? If they are to be properly dealt with, it means that the electricity supply industry must supply them either with "Eye-Rest" fittings (with a subscription towards the extra current they will have to consume), or with letters to enable them to obtain, at a reasonable rate of charge, spectacles from the Surgical Aid Society. But perhaps the industry rather than incur this additional expense, will advise these consumers to return to the less harmful incandescent gas mantle, the area of which brings intrinsic brilliancy within reasonable limits.

The author of the article on this subject talks generally round about the question, without touching the question of cost. We, of course, see the advantage of these "Eye-Rest" shields in preserving the eyesight, though nobody clamoured for anything of the kind until metallic filament lamps and flame arc lights came into our daily lives. We see the disadvantage of them from the point of view of economy. There are, however, many people who do not like the even illumination afforded by indirect lighting. Unless there are numerous sources of illumination scattered over the ceiling to uniformly illuminate it, the reflecting surface itself will offer a field for resting the eyes by letting them travel over highly illuminated spots, and then over the intermediate shaded spaces. About the room itself there is the effect of a uniform illumination. Of course, illuminating engineers whose professional ambition is to advise for a fee do not want means of illumination to become too stereotyped by the use of fittings such as those of the "Eye-Rest" type. Therefore they find fault with this reflected even illumination. It gives, they say, the occupants of the room a depressed feeling, and so forth. We have heard of occupants of electrically lighted rooms having a depressed feeling before indirect even illumination was introduced; and then the ennui and the depression were put down to stagnant air, and the absence of those air currents that are set up with gas lighting, and which medical authorities of modern thought and knowledge tell us are so essential to health and the maintenance of a fresh condition. Consumers who feel they must have metallic filament lamps have now the choice between eye-strain *plus* depression through stagnant air; eye-rest, *plus* cost of securing it and the depression arising from even illumination and stagnant air; or eye-rest, *plus* the cost of securing it, *plus* the cost of mechanical ventilation, and *plus* depression through even illumination. The problems are certainly varied and highly interesting to the consumer, just as they are to his would-be advisers our friends the illuminating engineers. By the way, the qualifications of these gentlemen are of such varied order to entitle them to the designation that they have not yet been properly determined. We shall not be surprised to hear the rumour presently that a Joint Committee of the Illuminating Engineering Society, the Institution of Gas Engineers, and the Institution of Electrical Engineers have been appointed to prepare a specification of, and standard test for, these qualifications. It is not clear whether this work should have been done before there was any attempt to prepare specifications and standards relating to artificial illumination of any kind, or for any purpose.

At the International Congress for the Prevention of Industrial Accidents, being held this week in Milan, Mr. L. Gaster is to contribute a paper on "The Value of Good Illumination as regards Health and as a Means of Preventing Accidents."

INSTITUTION OF GAS ENGINEERS.

Programme of the Annual Meeting.

THE Programme of the Annual General Meeting of the Institution of Gas Engineers, which, as already announced, is to be held in London from the 11th to the 13th prox., under the presidency of Mr. Robert G. Shadbolt, Engineer, Manager, and Secretary of the Grantham Gas Company, has been issued by the Secretary (Mr. Walter T. Dunn).

The business will be transacted at the Royal United Service Institution, Whitehall; and the proceedings on the opening day will consist, as usual, of the submission of the minutes of the last meeting for confirmation, the appointment of Scrutineers to examine the ballot-papers for the election of officers, members of the Council, and ordinary and associate members, the presentation of the Council's report [given below] and the accounts, and also the medals awarded for papers read last year. Then will follow the address of the President, and the reading and discussion of papers, a list of which was given in the "JOURNAL" for the 23rd ult., p. 211. In addition, there will be a report from the Refractory Materials Research Committee and another on the Education and Certification of Gas-Fitters. In the afternoon, a meeting of the Joint Commercial Sections of the United Kingdom will be held, to which members of the Institution are invited.

The proceedings on the second day will open with a meeting of the contributors to the Benevolent Fund, at the close of which the technical business will be resumed. There will be no afternoon sitting.

On Thursday, the remaining papers will be dealt with, and the usual concluding business—including the fixing of the place of meeting for next year—will be disposed of. In addition to the Presidents of the French and German Associations, Professor Bone will be proposed as an honorary member. In the evening, the President and Mrs. Shadbolt will hold a reception, to be followed by a dance, in the Connaught Rooms, Great Queen Street, W.C.

On Friday, the 14th, there will be an excursion to Cambridge, with luncheon in the Guildhall. In the afternoon, the Colleges, the University Laboratories, or the works and show-rooms of the Cambridge Gas Company may be visited. By invitation of the Directors of the Company, members will have tea in the Guildhall. A special train will convey them to and from Cambridge, and motor vehicles from the station to the Guildhall and back.

Annual Report of the Council.

The Council present the following report on the position of the Institution and the work upon which it has been engaged during the past year.

Membership.—On reference to the table below, it will be seen that the total number on the register at the close of the year 1911 was 865, compared with 843 for the previous year—an increase of 22. The additions consisted of twenty-one members and twenty associate members.

Class of Member.	At Dec. 31, 1910.	Elected and Transferred during 1911.	Deceased, Resigned, Transferred, &c., during 1911.	At Dec. 31, 1911.	Increase or Decrease.
Hon. members . .	22	..	..	22	..
Members	706	25 (4 transf'rd)	16	715	9
Associate members.	99	20	4	115	16
Associates . . .	2	..	..	2	..
Students	14	..	3	11	−3
Total . . .	843	45	23	865	22

The Council regret that the deaths of the following members have to be recorded:—

H. Barber	Sheerness
Henry Birch	Wellington (N.Z.)
Samuel Westall Durkin	Southampton
Robert Harrison	Monaghan
Raphael Herring	Dover
Harold Iago	London
Robert Morton	London
Charles F. Ruggles	Leighton Buzzard
George Edward Saville	Southport
James John Frederick Stevens	Belvedere, Kent
Joseph Timmins	Wigan

Annual General Meeting.—The forty-eighth annual general meeting of the Institution since its establishment in 1863 as the British Association of Gas Managers was held at Glasgow on Tuesday, Wednesday, and Thursday, June 13, 14, and 15, under the presidency of Mr. Alexander Wilson, Engineer and General Manager of the Gas Department of the Corporation of Glasgow. The large hall of the Glasgow and West of Scotland Technical College was kindly lent by the Council of the College, and every facility was afforded for carrying out all the arrangements for the meeting.

The programme of communications submitted, after the President's address, was as follows:—

Report of the Carbonization Research Committee.
Third Report of Gas-Heating Research Committee.

Report of the Refractory Materials Research Committee.
"Modernizing a Medium-Sized Undertaking," by Mr. C. F. Broadhead, of Middleton.
"Aspects of Gas Supply in a South American City," by Mr. Bernard F. Browne, of London.
"The Dessau Vertical Retorts at Sunderland," by Mr. Charles Dru Drury, of Sunderland.
"The Choice of a Carbonizing System," by Mr. P. C. Holmes Hunt, of Melbourne.
"Public Lighting," by Mr. S. B. Langlands, of Glasgow.
"The Woodall-Duckham System of Vertical Retorts," by Mr. J. P. Leather, of Burnley.
"Notes on the Corrosion of Service-Pipes," by Mr. James M'Leod, of Greenock.
"The Scientific Carbonization of Coal," by Mr. J. G. Newbigging, of Manchester.
"The Uses of High-Pressure Gas for Industrial Heating Purposes," by Mr. E. W. Smith, M.Sc., of Birmingham.

A lecture by Professor W. A. Bone, D.Sc., F.R.S., on "Surface Combustion," illustrated by experiments, was delivered on the Tuesday evening, and proved of very great interest.

The Institution was entertained at luncheon by the Corporation in the City Chambers on Tuesday, and at a reception and dance there on Wednesday evening.

By the courtesy of the Corporation, their electricity, gas, sewage, and tramway works were opened to inspection.

A visit was made to the Scottish Exhibition of National Art and Industry on the Thursday afternoon, by invitation of the President and Mrs. Wilson, who entertained the party at tea in the Red Lion Café in the Court of Music. A steamer excursion on the Firth of Clyde took place on the Friday.

The Council desire to record the expression of the members' acknowledgments of the very cordial and hospitable welcome which was extended throughout the week of the meeting, and for all that was done to make the occasion so interesting and agreeable.

Awards for Papers.—Through the generosity of Mr. H. E. Jones, the London Gold Medal, which he has kindly provided for the last seven years, is to be continued for a further term. The medal for 1911 has been awarded to Mr. Dru Drury, of Sunderland, for his paper on "The Dessau Vertical Retorts at Sunderland."

The Council, in considering the question of awards for papers, have decided that the Institution shall offer annually gold, silver, and bronze medals as first, second, and third awards respectively; the London Medal being placed as a class by itself. The three medals for the papers read in 1911 have been awarded as follows: The Gold Medal to Mr. C. Dru Drury for his paper mentioned above; the Silver Medal to Mr. E. W. Smith, M.Sc., of Birmingham, for his paper on "The Uses of High-Pressure Gas for Industrial Heating Purposes;" and the Bronze Medal to Mr. J. G. Newbigging, of Manchester, for his paper on "The Scientific Carbonization of Coal."

Committee on Reconstitution.—In the report of the Council to the annual general meeting in 1911, reference was made to the steps taken to give effect to the resolution passed at the annual general meeting in 1910, requesting the Council to appoint a Committee to consider the suggestions contained in Mr. Helps' Presidential Address which related to the constitution and future work of the Institution, and to report thereon to the members in general meeting assembled. Accordingly, a Committee was formed, comprising all the members of the Council with the addition of certain co-opted members—viz., Messrs. Thomas Berridge, C. E. Brackenbury, Charles Carpenter, John Carter, Francis T. Cotton, Thomas Goulden, Charles Hunt, H. E. Jones, J. G. Newbigging, R. O. Paterson, Fletcher W. Stevenson, Hanbury Thomas, and Charles Wood.

After considerable deliberation, directed by a more detailed memorandum upon the subject prepared and submitted to them by Mr. Helps, the Committee agreed that the time was not opportune for making any such recommendations to the members as those indicated in the resolution of 1910, and the Committee reported to this effect. The main reason for this conclusion was the proposal, then assuming definite shape, for the formation of a body representative of the industry generally, but more particularly charged with commercial and propaganda work; and it was felt to be most impolitic to advance any suggestions bearing in the same or a similar direction, until the publicity proposals had either matured or failed to meet with the requisite support.

It is well known to the members that the publicity movement has since been consummated in the successful formation of the British Commercial Gas Association under the auspices of the Institution. The Special Committee took the earliest opportunity, following upon this event, to again meet and deliberate upon the reference made to them in 1910. In the altered circumstances, it was generally felt that the new Commercial Gas Association met many of the present-day requirements indicated by Mr. Helps, and that as it had been launched with a generally understood probationary life of three years, it was but simple justice to allow it to proceed unhindered, and free from any conflict of aim or object with the parent body. Under the constitution and rules of the British Commercial Gas Association, it will be found that all departments—administrative and executive—have an *entrée*, and therefore a favourable field for activity and usefulness to the industry. Consequently, the Committee agreed that no useful purpose would be served by altering the constitution and basis of membership of the Institution at the present time, at any rate until the new Association had been given ample opportunity to justify its existence; and that the Institution will best serve its purpose by retaining its identity as a technical organization for the present. What relative position the Institution and the British Commercial Gas Association will eventually assume, the Committee do not profess to forecast. They therefore recommend: "That it is not advisable to make any alteration in the constitution of the Institution at present." Thus the whole question of a central organization, to embrace the industry generally, is left open and untrammelled for future treatment as occasion may require.

Affiliation.—The District Associations affiliated with the Institution have been represented on the Council during the year 1911-12 as follows:—

Eastern Counties Association	Mr. J. W. Auchterlonie.
Irish Association	Mr. R. Harrison. Mr. J. J. Paterson.
Manchester District Institution	Mr. H. Kendrick. Mr. E. H Hudson.
Midland Association	Mr. J. H. Brown.
North British Association	Mr. George Keillor.
North of England Association	Mr. John Lewis.
Southern District Association	Mr. H. C. Head.
Wales and Monmouthshire District Institution	Mr. A. H. Brookman.

Examinations in "Gas Engineering" and "Gas Supply."—Mr. Thomas Glover, Examiner in "Gas Engineering," reports that at the examination held on the 27th of April last 260 candidates presented themselves; 92 taking the Honours paper and 168 the Ordinary, as compared with 270 last year (94 Honours and 176 Ordinary).

Mr. J. H. Brearley, who had acted as Examiner in "Gas Supply" during a period of four years, resigned his position last year. It will be remembered that he took a leading part in the movement which resulted in the separate course for the study of "Gas Supply" being instituted, which took effect in the year 1908. The Council, while regretting the resignation of Mr. Brearley, feel that the industry is greatly indebted to him for the able and devoted manner in which he has carried out his duties.

The Council, on being invited by the Technology Committee of the City and Guilds of London Institute to nominate a successor to the vacant examinership, recommended Mr. Walter Hole, the Superintendent of the Gas-Mains and Distribution Department of the City of Leeds, and were fortunate in obtaining his consent The nomination has been accepted by the Committee, and Mr Hole has accordingly been appointed Examiner. He reports with reference to the examinations held on the 4th of May last that the number of candidates presenting themselves was 407, made up of 112 in the Honours and 295 in the Ordinary Grade, compared with 428 last year (89 Honours and 339 Ordinary).

The prize winners of 1911 in "Gas Engineering" were: Honours Grade—first, Mr. Frank L. Bassett, of London; Ordinary Grade—first, Mr. Harold J. Hailstone, of Birmingham; second, Mr. Allan Baker, of London; third, Mr. Edward W. Bennett, of London. In "Gas Supply" the prize winners were: Honours Grade—Mr. Stanley B. Johnson, of Hull; Ordinary Grade—first, Mr. William Heathcote, of Liverpool; second, Mr. Walter E. Oulds, of York; third, Mr. Fred Rothwell, of Reading.

Education and Certification of Gas-Fitters.—The Council during the past year have had brought under their notice a report issued by the Special Committee appointed to consider the question of the education and certification of gas-fitters, and have accepted and adopted it for laying before the members of the Institution at the forthcoming meeting.

Publicity and Special Purposes Fund.—In the last report of the Council, reference was made to the steps being taken for establishing a fund for extensively advertising the advantages of gas for domestic and industrial purposes; also partly for research, investigation, and other special work in the interests of the industry. A sum of approximately £13,000 per annum has, up to the present, been subscribed or promised; and the movement has led to the formation of the British Commercial Gas Association, under the auspices of the Institution, as provided by Article 3, Sub-section *h*, of the Institution's Articles of Association. The meeting at which the new Association came into being took place on the 12th of October last, at the Institution of Mechanical Engineers, and was well attended. The proposed constitution and rules of the Association were submitted and approved. Since then the Officers and Committees have been appointed and elected, and the machinery of the Association got into running order. The Council express the hope that the names of those undertakings not yet on the list of supporters will soon be added, so that all may bear a fair share of the cost of the work from which all must necessarily derive benefit in proportion to their magnitude.

Portrait of Mr. Thomas Newbigging.—Consideration has been given to some of the preliminary arrangements for celebrating the Jubilee of the Institution, which takes place next year. In this connection, the Council approached Mr. Thomas Newbigging with the suggestion that he should sit for his portrait, which it was desired to present to him in recognition of his long and honourable connection with the Institution from its formation in 1863 as the British Association of Gas Managers, and the many services he has rendered to the industry. They are happy to report that Mr. Newbigging has agreed to their suggestion; and they feel sure that every member will be glad of the opportunity of participating in the presentation.

Proposed Gas Exhibition, 1913.—As nine years will have elapsed since the last International Gas Exhibition was held at Earl's Court, it has been suggested that a further way of celebrating the Jubilee would be to organize an exhibition during the autumn of 1913. The Council have approached the Council of the Society of British Gas Industries on the matter; and, on receiving the promise of their co-operation, a Joint Committee was formed, representing the Councils of the two bodies, to consider the necessary arrangements.

After full deliberation, the Committee recommend that, provided there is evidence of sufficient support for the scheme to be brought to a successful issue, such an exhibition be held during the whole of the month of October, 1913, in the halls connected with the White City at Shepherd's Bush; and a circular-letter on the subject has been issued to all gas undertakings throughout the country, giving particulars of the scheme and inviting their support.

Coal Smoke Abatement Exhibition, &c.—During the year, the Institution has given its support to the International Smoke Abatement Exhibition held under the auspices of the Coal Smoke Abatement Society; to the International Exhibition of Non-Ferrous Metals and their Application; to the Optical Convention; and to the International Road Congress.

Special Purposes Fund.

Carbonization.—The Carbonization Committee, consisting of Messrs. Charles Carpenter (Chairman), Edward Allen, J. Ferguson Bell, A. E. Broadberry, T. H. Duxbury, Thomas Glover, D. H. Helps, W. R. Herring, William Langford, J. W. Morrison, R. G. Shadbolt, Harold W. Woodall, and S. Y. Shoubridge (Hon. Secretary), report that they have not been able to arrange a comparative test of the three principal systems of vertical retorts in use in this country. Certain difficulties presented themselves, which have so far not been overcome; but the Committee are not without hope that such a test may yet be carried out under their direction.

Refractory Materials.—The Refractory Materials Committee, consisting of Messrs. James W. Helps (Chairman), Edward Allen, J. Ferguson Bell, John Bond, A. E. Broadberry, H. G. Colman, R. G. Shadbolt, S. Y. Shoubridge, Alex. Wilson, H. W. Woodall, and F. J. Bywater (Hon. Secretary), report that they have had under consideration the third section of the standard specification —viz., that relating to silica material, bricks, blocks, and tiles, &c. The Committee have again collaborated with representatives of the Retort and Fire-Brick Section of the Society of British Gas Industries; and four other large manufacturers of silica goods were invited to join the Sub-Committee, so as to have as large a representation as possible of manufacturers of this class of refractory materials. The experience so far obtained with sections 1 and 2 of the standard specification has also been reviewed by the Committee; and their report on the matter, together with the third section of the specification, will be ready for presentation at the forthcoming meeting of the Institution.

Gas Research Fellowship.—Professor Bone has presented to the Council the following report upon the research work on "Surface Combustion" carried out under his direction by Mr. Harold Hartley, M.Sc., during his tenure of the Institution Gas Fellowship from September, 1909, to March 31 last, when he resigned on accepting the post of Chief Chemist to a large manufacturing company for which his training in the Department of Coal Gas and Fuel Industries at the University of Leeds had assisted him to qualify:

The work which Mr. Hartley has been engaged upon during his tenure of the Gas Research Fellowship is a continuation of the researches carried out at Manchester University during the years 1902 to 1906, by myself and pupils (R. V. Wheeler and G. W. Andrew), upon the influence of hot surfaces in promoting gaseous combustion. The results of this earlier work had been *in part* published in the Philosophical Transactions of the Royal Society (Vol. 206, pp. 1 to 68), under the joint names of R. V. Wheeler and myself, in 1906. A part of this earlier work—carried out in conjunction with G. W. Andrew —is still unpublished in detail, although I have epitomized it, together with later results obtained in Leeds by Messrs. Forshaw and Hartley, at various times in connection with my public lectures on "Surface Combustion" (Royal Institution, Institution of Gas Engineers, American Gas Institute, Franklin Institute of Philadelphia, &c.) during 1911. They were also referred to, and discussed, in connection with the report on "Gaseous Combustion" which I presented to the British Association in 1910 (Sheffield meeting), as well as in a lecture which I delivered before the North of England Gas Managers' Association at Newcastle-on-Tyne on May 1, 1909.

During Mr. A. Forshaw's tenure of the Gas Fellowship (1907 to 1909), certain experiments were carried out upon the influence of hot fire-clay upon the combination of carbon monoxide and oxygen. When Mr. Hartley succeeded to the Fellowship in September, 1909, I decided that he should devote his whole attention to the further elucidation of the factors operative in "Surface Combustion," with a view to a complete and consistent theory of the subject.

As it seemed desirable that he should be in a position to examine the electrical condition of metallic surfaces during "surface combustion," Mr. Hartley spent the first two months of his fellowship in Professor Bragg's laboratory, where he made himself familiar with modern apparatus and methods for the measurement of static electric charges, ionization effects, and the like. Thus prepared, he began his work with me in November, 1909; his first task being the installation and calibration of a delicate electrometer and accessory apparatus.

This done, he proceeded to examine the electrical condition of gold and silver surfaces during surface combustion—a task which occupied him many months. He proved that the surface becomes negatively charged during "surface combustion," negatively charged also in contact with the combustible gas, and positively charged in contact with oxygen, at a given temperature. Great difficulties were encountered during these experiments, however, owing to the breakdown of the insulation at the high temperatures which it was necessary to employ; but the results left no doubt as to the connection between "surface combustion" and corpuscular electric effects.

He next undertook experiments upon the influence of water vapour upon the combination of carbonic oxide and oxygen in contact with hot fire-clay; confirming and extending the discovery previously made during Mr. Forshaw's tenure of the Gas Fellowship, that the surface combustion of carbon monoxide is greatly retarded by the presence of steam—a circumstance which at once differentiates "surface combustion" from ordinary flame combustion. Subsequently he proceeded to investigate the relative ratio of oxidation of methane, hydrogen, and carbon monoxide in contact with hot fire-clay; obtaining striking evidence of complete reversals in surface combustion of the affinities of methane, on the one hand, and of hydrogen and carbon monoxide, on the other hand, for oxygen, as compared with ordinary flame combustion.

In addition to the foregoing, Mr. Hartley has investigated in great detail the influence of hot surfaces, such as fire-clay, copper oxide, porous porcelain, and silver, upon the combination of carbonic oxide and oxygen, with results which accord very well with those of the previous work of Mr. R. V. Wheeler and myself upon hydrogen and oxygen. During the last few months of his work, he was engaged upon the measurement of "temperature coefficients" in the case of a silver surface, with results indicative of a "compound interest" law. This work was interrupted on March 31, 1912, when he resigned the fellowship to take up the post of Chief Chemist with the Richmond Gas Stove and Meter Company, of Warrington.

I am of the opinion that Mr. Hartley has prosecuted his work with commendable energy and perspicacity in the face of, at times, great experimental difficulties. The results of his work have materially advanced the science of surface combustion; and I much regret that, on account of his new appointment, his connection with the investigation has ceased.

I hope during the coming winter to find time and opportunity for editing for detailed publication in the scientific Press the great accumulation of experimental results obtained by myself and co-workers—including Mr. Hartley—since the appearance of the previous memoir on the subject in the Philosophical Transactions of the Royal Society in 1906. In accordance with the fellowship regulations, copies of all papers which may be published will be forwarded in due course to the Senate and to the Institution of Gas Engineers. After such detailed publication, I shall hope to embody the principal results, and my conclusions thereon, together with such practical suggestions as may arise therefrom, in a summarized report suitable for presentation to the Institution of Gas Engineers.

Livesey Professorship.—The Council have to report that Professor Bone, having been appointed Professor of Fuel and Refractory Materials at the Imperial College of Science and Technology, London, has resigned the Livesey Professorship of Coal Gas and Fuel Industries at Leeds University, and that Mr. John William Cobb, B.Sc., technical assistant to the Managing-Director of the Farnley Iron Company, has been appointed to succeed him.

International Commission on Photometry.—A report of the meeting of the International Photometric Commission held at Zurich from the 26th to the 29th of July, 1911, has been presented by the Institution's delegates, Dr. H. G. Colman and Mr. W. J. A. Butterfield, who attended in the unavoidable absence of Mr. Charles Carpenter and Mr. J. W. Helps. [The proceedings forming the subject of the report which is given, were fully noticed in the "Journal" at the time.] It may be added that negotiations are in progress with a view to a consideration of the question of the composition of the Commission and the nature of its future work.

Standard Specification for Street Lighting.—The representatives of the Institution (Mr. S. Y. Shoubridge and Mr. Robert Watson) on the Committee formed for the purpose of formulating a standard specification for street lighting report as follows:—

The Joint Committee, consisting of representatives from the Institution of Electrical Engineers, the Institution of Municipal and County Engineers, the Illuminating Engineering Society, and the Institution of Gas Engineers, have continued their meetings during the past twelve months. As was reported last year, the Committee generally considered that illumination should be taken as the basis of public lighting contracts, with the foot-candle as the standard unit.

With reference to the method of testing, though differences of opinion have occurred, the majority of the Committee have been strongly in favour of appraising street lighting by the minimum illumination obtained and measured in foot-candle values by the horizontal method of testing; and most of the work of the Committee has been done with this method as a basis.

It was felt that a fixed minimum illumination for streets of various widths and importance would be desirable; and the delegates of the Institution of Municipal and County Engineers were asked to visit some typical streets, representing different degrees of illumination requirements, for the purpose of classifying them according to their views as buyers.

Their report, together with valuable experimental data obtained from actual street tests and calculations by members of the Committee, has been fully discussed at various meetings, and resulted in a useful classification of streets. At a later meeting, alternative drafts and clauses were submitted, in which it was left optional to the specifying engineer to base the contract either on (*a*) the minimum measured illumination on a horizontal plane, or (*b*) the direct measurement of the illuminating power of the source of light at defined angles. The discussion of this proposal was followed by a circular-letter sent by the Secretary to each member of the Committee, asking for expressions of opinion from any who considered that "an alternative specification

based on measurement of candle power should be proposed." The representatives of the Institution of Gas Engineers expressed themselves in favour of such alternative specifications, but found themselves in the minority.

The fundamental basis of the present draft specification is therefore minimum illumination on a horizontal plane at a height of 3 ft. 3 in. above ground level, and measured either by (*a*) an illumination photometer, or by (*b*) a photometer giving direct-ray values to be corrected to the horizontal basis by calculation. The draft clauses deal with the conditions under which tests should be made, the classification of streets already referred to, the scheduling of lamp positions, main features and height of lighting units offered, the provision of special clauses to suit the needs of particular localities, and the inclusion of usual contract clauses.

The specification, when complete, will be fully considered by the Council of the Institution.

Alkali Manufacturers' Opposition to Gas Bills.—In consequence of the strenuous opposition being offered by the Alkali Manufacturers' Association to all Gas Bills in the present session of Parliament, whereby a clause had already been imposed on the South Suburban and other Gas Companies restricting them from purchasing residuals from any other gas undertaking, the Council of the Institution felt it to be their duty to take such steps as were possible to combat this movement. Acting in conjunction with the Gas Companies' Protection Association, a letter was issued to all undertakings in the United Kingdom asking for replies to the following questions:—

1.—Do you make up your gas liquor into sulphate of ammonia or concentrate?
2.—Do you make sulphuric acid?
3.—Do you distil your tar or prepare it for road purposes?
4.—Do you purchase ammoniacal liquor, tar, or spent oxide from any other gas undertaking?
5.—Do you sell any of the alkali products to any other gas undertaking?
6.—If you sell your residuals to chemical manufacturers, is there any real competition for them?
7.—Have you any legal restrictions against:
   (*a*) Using up your own residuals?
   (*b*) Buying residuals from other gas undertakings to be worked up along with your own?
8.—If you have any other information to give that may be of assistance, please state it.

An interview on the subject with the Lord Chairman of Committees was sought and granted; a deputation representing the Institution and the Association being received, with the result that his Lordship promised that the information laid before him and elicited by the replies to the questions issued should receive due consideration.

Income-Tax and Depreciation.—Further action has been taken by the Council, in co-operation with the representatives of various gas companies, with reference to the question of income-tax and depreciation, which it is hoped may lead to a satisfactory settlement at an early date.

National Insurance Bill.—The Council are also giving consideration to the National Insurance Bill as affecting gas-works employees, with particular reference to Part II. (Unemployment Insurance). While appreciating the complex nature of this subject, they feel that, in the interests of the industry, they should do whatever is possible on its behalf.

Strike Clauses in Contracts.—Arising out of the effects of the recent coal strike, the attention of the Parliamentary Committee has been called to the desirability of recommending a model strike clause suitable for insertion in contracts made between gas undertakings and contractors for the purchase or sale of coal, coke, and tar and other products, or with consumers for the supply of gas for both private and public lighting; and the matter is now under consideration.

Various other subjects, which are not mentioned in this report, have also received the attention of the Parliamentary Committee during the year.

ROBT. G. SHADBOLT, *President.*
WALTER T. DUNN, *Secretary.*

May 25, 1912.

[Appended to the report is a list of the additions made to the library during the year, for which the Council express their thanks; also the statement of accounts and balance-sheet for the year ended Dec. 31, 1911, duly certified by the Auditors, Mr. James L. Chapman and Messrs. Wood, Drew, and Co. The subscriptions from gas companies and corporations to the Publicity and to the Special Purposes Fund stood at £6156 on Dec. 31. Of this amount, £5853 was transferred to the British Commercial Gas Association, and £303 to the Special Purposes Fund. The carry-forward on the Association account is £5342.]

Report of the Benevolent Fund Committee.

The Committee report that during the year ended Dec. 31, 1911, the amount of £315 19s. 10d. was received. Subscriptions produced £185 18s. 6d.; donations, £24 5s. 6d.; and interest on investments, £105 15s. 10d. The expenditure amounted to £279 5s. 9d.; £259 15s. having been granted in the relief of thirteen necessitous cases, and £19 10s. 9d. paid for printing, postages, and bank charges.

[The list of contributors for the past year and a copy of the accounts, duly certified by the Auditors, Mr. James L. Chapman and Messrs. Wood, Drew, and Co., are appended to the report.]

THE SO-CALLED RELATIONS BETWEEN THE CHARACTERISTICS OF GAS.

IT was intimated in a recent number of the "JOURNAL" that M. ANDRÉ GREBEL had been considering, in the "Journal de l'Eclairage au Gaz," the so-called relations between the characteristics of gas. The conclusion he arrived at was that there is not, and cannot be, any exact relation between the various powers of this illuminant. Their values fluctuate, he says, within tolerably restricted limits for ordinary coal gases; but they are not subject to any other law than that governing mixtures.

M. Grebel deals first with the variations which are found in the quality of gas supplied from the same works. He points out that the use of recording instruments has demonstrated, more or less in every branch of industry, though the indications are often only relative and wanting in precision, that a single measurement is not enough to test a process of manufacture or estimate the value of a product. All gas engineers are convinced that the standard of gas is not invariable; but have they all an accurate idea of the extent of its fluctuations in the same distributing system? Observations made in two different parts of a large town gave the following results: In one place, 116·3 litres in the morning and 104·8 in the evening; and in another, 104·8 litres in the morning and 95·1 in the evening (the standard being 105 litres). The following maxima and minima were noted, on another day, in four totally different places: Morning, 99·8 litres and 123 litres; evening, 99·3 litres and 105·4 litres.

The differences in the extreme daily variations thus exceed 20 per cent., which can be easily explained. It is well known that the richness of gas varies considerably during the process of distillation; that the adding together of the products of alternate charges does not prevent these fluctuations; that stratifications are formed in gasholders; that carburation is neither constant nor continuous; and that strange "sections," so to speak, of rich or poor gas occur in the mains, the extent of which represents a notable portion of the daily delivery, especially when the consumption is not great. In spite of this, one might readily believe in a certain immutability of heating power. But, on reflection, it is found that this cannot be the case. Observations of the heating power of gas, taken at a point in the same large town from hour to hour between 8 a.m. and 6 p.m. (lighting-up time) on one day, showed that the difference between the extreme limits exceeded 400 calories, or from 8 to 10 per cent.; and that during the year it reached 20 per cent. between the maximum and minimum records. M. Grebel considers that this fact should be taken into account in the framing of new clauses in contracts relating to the testing of gas.

The author next deals with the question of the relation between what he calls the "auto-lighting" power and the heating power of gas. At the outset, he asks his readers to bear in mind the fact that illuminating gases are mixtures of fixed gases and vapours, and essentially variable mixtures, even at the outlet of the gasholders. Why, then, should absolute relations be necessarily required between their different properties, especially when it is a question, for one of them, of a conventional property depending upon the standard burner employed? In the case of coal gases of very similar composition, not having, for example, too variable quantities of carbonic oxide and carbonic acid, can there, he asks, be any relation between lighting and heating power? He answers his question in the affirmative. But he has no hesitation in saying that this relation cannot be expressed in a single law, though such an opinion is at variance with those held by several exalted personages, who pretend they have discovered and verified an exact relation between these two characteristics—one empirical and the other scientific—of illuminating gas.

Having compared in some detail the different coefficients of combustion of the constituents of illuminating gas, M. Grebel proceeds to indicate the meaning of the expression "auto-lighting" power—viz., an "extrinsic" property of the gas. Whatever method of testing may be adopted, it is only useful with gases which are very similar to the typical gas with respect to which it has been established. Taking for example the Dumas and Regnault photometer, and the method of using it, it is only useful with gas which can, when burning under a pressure of 2 mm. to 3 mm. of water, give the light of one carcel (9·6 candles) on the horizontal, with a consumption of 105 litres (3·7 cubic feet) of gas per hour with a burner of the Bengel type. When the gas is too rich, it smokes; and when it is too poor, the flame comes out of the chimney. It may be further admitted, in the case of a similar gas, that the lighting power is practically proportional to the delivery between 120 and 90 litres (4·20 and 3·17 cubic feet), for example, in accordance with the experiments of M. Lecomte. But there is really no authority for arguing from the Dumas and Regnault method, adopted to ascertain whether a gas is or is not at the standard of 105 litres per carcel-hour, to the extent of measuring the "lighting power" of gas at 80 litres, at 150 litres, and even at 200 litres. With a photometer allowing the variation of the distances between the screen and the standard or the source of light to be tested, one can, on the contrary, determine the quantity of light given by gas in proportion to the hourly delivery to a Bengel burner. The illuminating power, defined by the experimental rules given by Dumas and Regnault, determined with some

accuracy the nature of a lighting gas. The too rigorous condition of working at a pressure of 2 mm. to 3 mm. in the burner bars the way to carburetted water gas, and even modern coal gases, which, containing a considerable amount of carbonic oxide and carbonic acid, necessitate a pressure of 4 mm. at least.

Discussing the various burners in use, M. Grebel says it is evident that there cannot be a burner suitable for everything—utilizing to the best purpose all kinds of gases, from mixtures of hydrogen and methane to acetylene. Batswing burners, with a narrow slit, are suitable for rich gases, and burners with wide slits for those which are relatively poor. The amount of air entering into the crown of the burner can be regulated in the "Metropolitan" argand No. 2 of Mr. Carpenter. But although this burner has much greater efficiency than the Bengel, M. Grebel thinks it cannot have a maximum efficiency with all gases, any more than can the burner of M. Sainte-Claire Deville, with which all the admitted air can be regulated. Going still farther than Mr. Carpenter, M. Sainte-Claire Deville transformed a Sugg argand burner so that the consumption of all the oxidizing agent can be regulated and even measured like gas. He styles the minimum hourly consumption per carcel the "absolute" lighting power; the air being regulated so that its delivery cannot be modified without changing the intensity of the flame. To employ it as a test instrument, and place it within reach of ordinary workers, M. Grebel thinks the conditions of combustion should be more clearly defined, and that then this definition should be accepted. Employment of the Sugg burner with artificial draught cannot be justified, any more than the Bengel or the Carpenter burner, with gases which differ very much, in composition and percentage of light-giving hydrocarbons, from those with which it gives its maximum efficiency.

The next question discussed by M. Grebel is the existence of a relationship between the lighting power of gas by incandescence and its heating and auto-lighting power. He acknowledges that he is entering here into the field of pure imagination. In the first place, what is the lighting power of gas by incandescence? The efficiency of this method of lighting, expressed by the ratio of the consumption of gas to the luminous intensity, or by the inverse ratio of the luminous intensity to the consumption, varies easily by 2 litres per horizontal candle-hour to 1 litre, according to the upright burner employed, though perfectly regulated, provided with excellent mantles, and working under most favourable conditions. With burners working with compressed gas, and reheated by the products of combustion, it is known that the brilliancy of mantles can be enormously increased without obtaining any greater spherical efficiency than with small intensive burners furnished with perforated chimneys. Among the latter, those with an hourly delivery of 80 to 100 litres give the lowest consumption, with the most suitable gas at the most favourable pressure.

It is this question of efficiency of the burner which struck M. Sainte-Claire Deville when he decided to measure what he styles the "absolute" lighting power of gas by incandescence, by enclosing in a small space the primary air-holes of an ordinary long upright bunsen burner. Thus he was able to regulate and measure the consumption of primary air like gas; and he studied the maximum luminous power for different kinds of coal gas compatible with the dimensions of a mantle. Attention may be drawn to the difficulty there always is to fill a mantle entirely with the flames from different kinds of gas more or less well mixed with primary air, because the height and form of the flames vary very much according to circumstances, and without any definite rule, especially when mixtures requiring rather different velocities for the propagation of ignition are made to issue from the same burner. On the other hand, with this system of burner, in the open air, no control is had over the surrounding atmosphere. M. Casaubon pointed out, very rightly, in 1906, that there is a considerable difference between working in the open air and in an enclosed space. In the first case, it is necessarily found that the best proportion of primary air is less than the theoretical quantity. However this may be, it is possible to imagine a test-burner with a total artificial and measurable air supply working in clearly defined conditions. One may even suppose that its flame would adapt itself perfectly to the shape of the mantle. But what would these mantles be? Between mantles of the same geometric form, of good shape, the same weight, the same age, and the same make, there are variations of at least 10 to 15, and even 40, per cent. in the luminous power attributable to them. M. Grebel leaves his readers to draw their own conclusions about the value of "absolute" measurements of radiant substances which are so variable in quality. He thinks it is easy to understand why no specialist has ventured to propose openly a method of testing gas based upon trials made with incandescent burners.

Having dealt shortly with the question of whether or not there is a relation between the calorific power of a gas and its capacity to absorb the supporter of combustion, M. Grebel comes to the conclusion that there is not, and cannot be, an exact relation between the auto-lighting, the incandescent lighting, the calorific, and the "comburivorous" (to use his newly-coined word) power of a gas. The values of these various powers fluctuate between tolerably restricted limits for ordinary coal gases, but are not subject to any other law than that which governs mixtures. He considers that the test of a gas which would apply to only one of its intrinsic properties—calorific power—would be insufficient to determine its actual utility. For this reason, he proposes to measure simultaneously both the calorific power of a gas and its capacity to absorb the agent by which its combustion is supported.

CONTROL OF ILLUMINATING GAS SUPPLY IN THE UNITED STATES.

THE first portion of this review of the contents of the recently issued "Circular of the Bureau of Standards," which was published in the "JOURNAL" last week (p. 501), gave a summary of the set of rules which the Bureau puts forth as a model for a municipal ordinance for the protection of the gas-consuming public. We expressed doubt whether any benefit will accrue to the gas consumer from the promulgation of such an ordinance in districts where the supply of gas is maintained by a company in open competition with suppliers of other sources of light, heat, and power.

It will now be of interest to extract from the "circular" a few particulars of existing ordinances. The information has been obtained by way of answers to a series of questions addressed by the Bureau to the Clerk of each town having a population in excess of 25,000. There are, in the United States, 228 such towns, of which 60 have some municipal requirements in respect of candle power, heating value, purity, pressure, or testing of meters for the gas supplied to consumers. Of the remaining towns, the gas supply is under State laws only in 103, and is subject to no requirements in 47 towns. In seven towns, only natural gas is supplied; in three towns the question of legal requirements is in abeyance; and from ten towns the desired information was not secured.

The information obtained from the 60 towns which have municipal requirements is set out in a number of tables. In addition to the candle power required, which ranges from 14 to 22, with two exceptional cases of 27 and 35 candles, particulars are given under the head of candle power requirements as to the times and methods of testing in a few cases only; and the inference is that testings of illuminating power are in fact only made in a few cities, and there only rarely. In twenty towns, with a population of over 25,000, a heating value is prescribed; but tests appear to be carried out in only a few places, and daily in only four. The heating value required is commonly 600 B.Th.U. gross per cubic foot. This appears to be the average value, and not the minimum. In one case, a daily minimum of 550 B.Th.U. gross is mentioned. Purity regulations prevail in 22 large towns, generally referring merely to absence of sulphuretted hydrogen. In three cases only is there a limit prescribed for carbon monoxide—viz., 25 per cent. by volume. Where a sulphur limit is named, it ranges from 15 to 30 grains per 100 cubic feet; and the ammonia limit, where existent, varies from 4 to 10 grains. In a few instances, impossible conditions are named—such as "freedom from sulphur," and "no carbon bisulphide allowed." The pressure regulations are few, and are only noteworthy in respect of the minimum allowed, which is only less than 15-10ths in one instance, and is more commonly 20-10ths or over. Meter testing requirements are naturally more general and more detailed.

The tables referred to in the foregoing paragraph are followed by a "discussion" of gas ordinance requirements, which opens with the auspicious statement that "The selection of proper gas ordinance requirements must be influenced by two considerations of primary importanee: First, what is the desirable condition to be attained, and, second, what is possible from the manufacturing, distributing, or financial standpoint." Obviously the discussion of the first consideration may offer scope for the airing of bureaucratic views; but since the first is, as a practical issue, wholly subordinated to the second consideration, which is far removed from the academic sphere, it seems strange that the Bureau of Standards should have essayed this discussion at all. Of what worth is the knowledge or judgment of a Standards' Office on questions of what is or is not possible from a gas manufacturing or distributing standpoint, to say nothing of financial matters? It were better that bureaucracy should recognize its limitations, and be content to do well the work for which it was established, while leaving the discussion and settlement of practical affairs to persons practically acquainted with them. For the information of those who regard views as authoritative merely because they are "official," we may, however, just indicate the general trend of the "discussion" of gas ordinance requirements in the Bureau's "circular."

At the outset, an attempt is made to briefly describe—it is the Bureau which splits the infinitive—the methods of gas manufacture. The descriptions seem unlikely to be of service to anyone; but it is remarked that "the advantages of coal, water and mixed gas must be considered primarily from the economic or manufacturing standpoint, since the advantages of each to the user are in most cases only the indirect result of the economy of manufacture." Which is another way of saying that the gas manufacturer is in the best position to decide which type of gas is most advantageous to the consumer in any given locality and circumstances. It is argued that photometric control of the quality of gas is desirable in cities having a population above 200,000, even if the heating value of the gas is regularly tested, because these larger cities contain districts, especially among the poorer classes, where a considerable amount of gas is used in open-flame burners. The argument is a curious one. Put in another way, it is that the majority of gas consumers—*i.e.*, the users of incandescent burners—are to be penalized by having to pay a relatively high price for gas in order that a minority of consumers, who are thriftless enough to continue to use open-flame

burners, may have a quality of gas which will tend to the perpetuation of their thriftlessness. The justification of the argument of the Bureau in favour of control of the illuminating power of gas thus seems lacking from the economic standpoint. The standard burner recommended for testing is for water gas Bray's No. 7 slit-union burner, and for coal gas the "D" or "F" argand. It is then said, "The use of the very expensive 'Metropolitan' No. 2 (Carpenter) argand is not recommended; but if is used a higher candle power requirement should be made." We are also told that it is unwise to permit the use of "any other burner best suited to the gas." All of which shows that the Bureau has not grasped the essential principle underlying gas supply—viz., that the quality of the gas should be modified *pari passu* with advances in apparatus for its consumption, so that the consumer may at all times forthwith secure the highest possible return from the money which he expends on the purchase of gas.

The "discussion" goes on to the subject of "Heating Value Specifications." Some observations disclose certain curious misconceptions on the part of the Bureau as to the behaviour and action of calorimeters. It is true, as is stated, that water vapour is carried off in the escaping products of combustion; but it is equally true—which is not stated—that in a well-designed gas calorimeter the water vapour thus leaving the instrument is commonly no greater in volume than the water vapour entering it. Ultimately, however, the Bureau decides—although not on the strongest grounds—to specify "gross" instead of "net" calorific value. This is satisfactory, as is also the fact that the Bureau's investigations of gas calorimeters have shown that the ordinary sources of error in making determinations with them lead to too low a result being obtained for the heating value of the gas. This remark may serve to check the campaign which was instituted some time ago for the purpose of imposing so-called "corrections" on calorimetric readings, the ultimate effect of which was the depreciation of the value of the gas. The Bureau indicates that if any "corrections" are needed, they are in the opposite sense—viz., to raise the observed calorific value of the gas under test.

On the question of the purity of gas, a great deal of ignorance as to the chief purpose of the abstraction of sulphuretted hydrogen from gas, and as to the sensitiveness of the lead paper test, is displayed. The "circular" states in regard to total sulphur, "The question as to total sulphur limits is not what amount of sulphur is dangerous either to health or property, but, rather, what is the least sulphur readily obtainable in good practice with the present coal supplies." This quotation well illustrates the bureaucratic attitude, which may be taken as: Frame and impose restrictive ordinances, with danger or injury to health or property as an excuse for their imposition if it can be alleged, but if it cannot, well! frame and impose the restrictions all the same! A public service company must not be allowed to perform its duties to the community without being subjected to harassing restrictions, even though the only justification which the official mind can offer for them is that the company can work under them without any very great difficulty.

Carbon monoxide would doubtless have been dealt with very severely in the "discussion" had it not been that long years of practical experience in the distribution of gas containing a comparatively high proportion of carbon monoxide have put the gas undertakings in a very strong position to contest the validity of academic deductions as to the high toxity of such gas. It now seems to be recognized that the suicide and the inebriate will meet their ends, whether the gas distributed is coal gas, carburetted water gas, or mixed gas, and that the interests of gas consumers must be the prime consideration in determining which class of gas is to be supplied in any town. The gas companies of the United States have been able to say with effect "hands-off" to the officials and legislators who have desired to impose restrictions in the matter of the amount of carbon monoxide in town gas supplies.

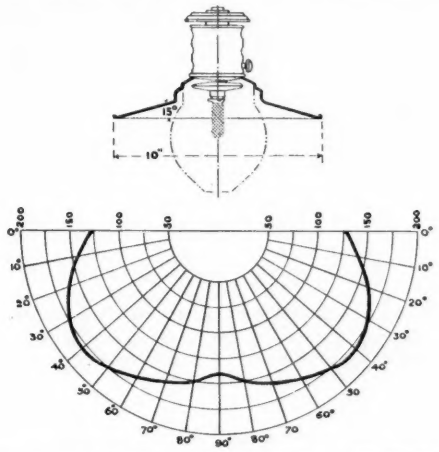
At a later date, we propose to refer to the State, as distinct from the Municipal, regulations for the control of gas supply in America.

As already announced in the "JOURNAL," the spring meeting of the Association will be held at Oldbury on Thursday, under the presidency of Mr. A. Cooke, the General Manager of the gas undertaking of the Urban District Council. The members will assemble at the Public Buildings, where they will be received by the Chairman and members of the Gas Committee. After the reception, they will proceed to the gas-works, for an inspection under the guidance of the President and his assistants.

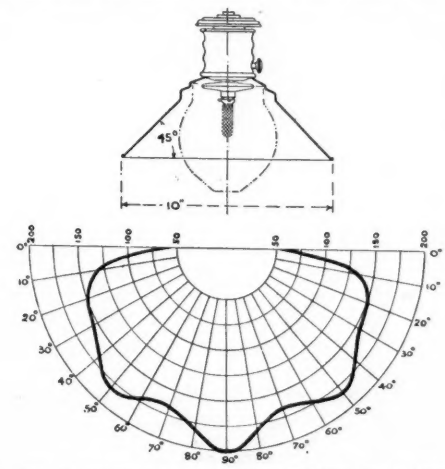
Mr. GEO. E. WOODFORD, of Ruabon, we learn, with regret, died last Wednesday. Although physically incapacitated for the last three months, he died practically in harness—conducting and arranging matters in his official capacities up to the day of his death. Mr. Woodford entered the service of the late Mr. Henry Dennis in 1868; and at the close of the present month he would have completed forty-two years of service with the Ruabon Water Company—having been appointed Secretary on the passing of their Act in June, 1870. In addition to this appointment, he held those of Secretary to the Rhos Gas Company, the Barmouth Gas Company, the Dolgelley Gas and Coal Company, and the Dysynni Gas Company. He was also a Director of the Denbigh Gas and Water Companies, and held other offices in undertakings the late Mr. Dennis was connected with and now carried on by his son, Mr. H. Dyke Dennis.

POLAR CURVES OF REPRESENTATIVE KEITH PATENT INVERTED LAMPS.

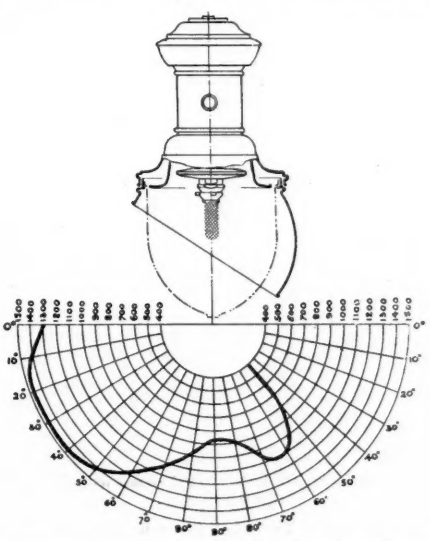
WE have here a very instructive series of polar curves of representative Keith high-pressure inverted gas-lamps. There has been comparatively little work of this kind done at home in connection with gas-lamps; and on various occasions interested persons—illuminating engineers, architects, and others—who have



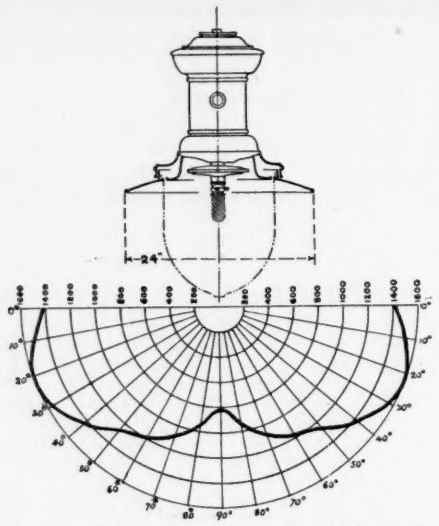
No. 1.—150-Candle Power Lamp, Indoor Pattern, with Shallow Shade.
This shows an even distribution of light for general purposes.



No. 2.—150-Candle Power Lamp, Indoor Pattern, with Deep Shade.
This shows a somewhat concentrated light more especially suitable for bench-work; the best illumination being vertically below the mantle.

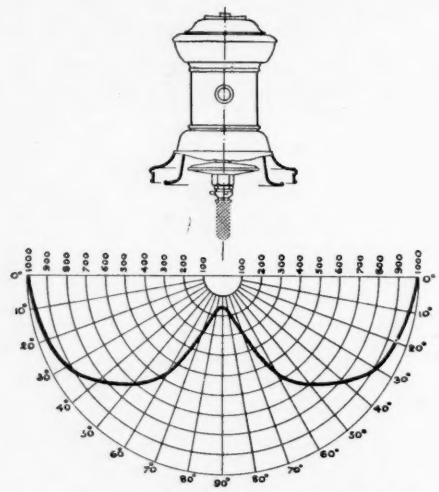


No. 3.—1000-Candle Power Lamp with Parabolic Reflector.
This shows a characteristic curve for this type of reflector, where the bulk of the light is required to be concentrated in one direction. The actual light from the mantle is 900-candle power in a horizontal direction without reflector; this being increased to about 1475-candle power maximum in the direction required.



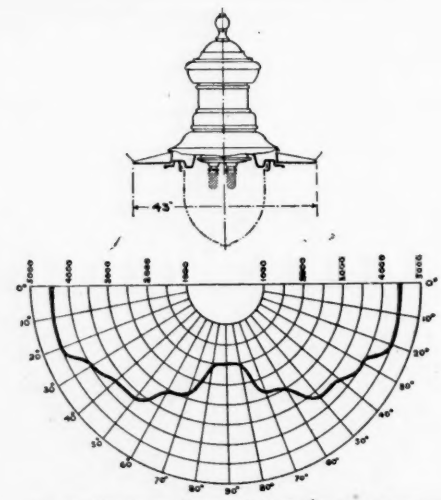
No. 4.—1500-Candle Power Lamp, Standard Pattern.

This shows a characteristic curve of the standard pattern of lamp, showing a good distribution of light for all general purposes.



No. 5.—1000-Candle Power Lamp without Reflector.

This gives a very good idea of the distribution of light from a lamp without reflector, and with all the other reflecting surfaces blackened. It is interesting to compare this curve with the preceding one from the lamp of standard pattern, showing how the curve is modified by the reflector.



No. 6.—4500-Candle Power Three-Light Lamp with Octagonal Opal Glass Reflector.

This shows a light very well distributed near the horizonta direction, such as is desirable for street and similar lighting.

asked for published curves of British makes of high-pressure gas-lamps have had to be sent away without satisfaction. These curves will therefore be of immediate interest to many students of the subject, and will be of permanent value as a guide, while incidentally testifying that the nominal values placed on Keith gas-lamps to distinguish them one from the other are fully justified by the photometrical measurements at useful angles.

The curves show, too, the importance of a proper selection being made of shades and reflectors for given purposes. A lamp has a certain candle power—used without a reflector, or with an ordinary standard distributing reflector—at the horizontal, or at angles near the horizontal; but if we look at curves Nos. 2 and 3, we see how the light rays can be concentrated by special shades or reflectors so that the normal candle power is enormously exceeded in the direction in which the light is concentrated. Deep shades which, as it were, bunch the light rays (direct and reflected) together ought really to be called concentrators, and not reflectors. Look at No. 3 curve, for example, with the parabolic reflector. Without a reflector, this lamp gives 900-candle power at the horizontal level (looking at No. 5 curve it would not be an exaggeration to take credit for the full 1000 candles at the horizontal); but fitted with the parabolic reflector, the curve shows 1475-candle power—nearly 50 per cent. more than the nominal candle power of the lamp!—between, on the open side, the angles of (say) 15° and 45°. The curves obtained from lamps fitted on the standard lines (curves Nos. 1, 4, and 6) all show a good excess candle power over the nominal at the angles that are of importance in distribution. The standard fitted lamps also disclose, by the curves, an excellent uniformity in characteristics, though it is rather interesting to note the variation there is in the angles of maximum illumination of the different candle-power lamps.

Professor Morris and other investigators have borne witness to the excellent and dependable polar curves that can be obtained with high-pressure gas lighting; while the inconstancy of the flame arc lamps denies to the experimenter anything of a very reliable character. The polar curves that we publish to-day of the Keith high-pressure gas-lamp are of interest and value from several points of view. With the lines beneath the curves, no further comment or explanation is necessary.

THE ADVERTISING OF GAS-COOKING, &c.

ARE OUR METHODS RIGHT?

By T. E. Pye, of Chichester.

The object of the writer in the present article is to arouse discussion, rather than to submit or to claim original ideas in relation to one of the most important present-day sources of revenue in our industry—viz., the use of gas for cooking—and by such discussion to bring under consideration the best means to be adopted for effectively advertising this branch of our business.

I am, of course, not presuming to encroach upon, or offer any suggestions in, the domain of the British Commercial Gas Association. The work of that body, if I mistake not, will for some time at least be practically confined to watching very closely the interests of the gas industry in relation to the advertising propaganda of the sister industry, and in keeping the British public well informed as to what value they may safely attach to those very ingenious and artistic fabrications, in the form of trade advertisements, which our friends the enemy from time to time so assiduously circulate among our own customers.

It has, of course, from the first been recognized that much of the aggressive advertising work of our up-to-date gas undertakings in keen competition with electricity, must be continued with unabated vigour in spite of the Association's efforts, and that the work of the one must, all over the country, be supplemental to that of the other. The subject-matter of the present article is obviously among such as must, and can only with the best effect be carried out by local effort, and be successfully adapted to local conditions. Is this being done to the best effect, under conditions calculated to bring about the best results? I am doubtful, very.

Disappointed Hopes.

Most gas managers have had direct or indirect experience of the local gas exhibition, as carried out under the time-honoured conditions, including the essential lectures on gas cookery by the duly diploma'd lady lecturer. It would be highly interesting, if not actually diverting, to hear the honest opinion of many a gas manager upon certain phases of this special effort of his. If, as the song says, "We only, only knew," what a depth of humiliation would be revealed—of disappointed hopes; hopes born under the stimulus of hundreds of cookers going out, at a large expense to the undertaking; probably raised still higher by an exhilarating increase in the output of gas; and then, some months later, after gas bills have gone out and slot collections have been made, comes a rude and cruel awakening. Inspectors report that numbers of the new cooker ovens are being used as meat safes, cupboards—anything, in fact, except for gas cooking. The reason given by the customers for this astonishing *volte-face* is that they find that cooking by gas is (as they do it) too dear for them. They have gone back to coal; and their definition of the gas company's advertisements of cheap gas cookery is—well, this depends on the nature of their vocabulary.

The manager of the small undertaking may possibly have some advantage over his brother of the large town in this, that he is brought more closely into contact with the customer, and thus has better facilities for impressing upon the customers the

numerous advantages of his speciality. But this has been my experience, and I doubt not that of a very large number of other managers similarly situated. I have personally met with it more than once, and have endeavoured to grapple with the difficulty. I believe, however, that the trouble to a great extent originates with the nature of the work done at the exhibition. It may also be enhanced by the circulation of a certain class of literature which at the present time is much in evidence, and which may do untold mischief to our industry. But more of this anon. To return to the exhibition.

The Method in Question

Attempting to profit by previous disappointing experiences, when arranging an exhibition for one of the undertakings I have served, I endeavoured to stipulate for what I actually wanted in the way of gas cookery demonstrations. At first I could not understand the hesitation which the firm of stove manufacturers with whom we were negotiating manifested in carrying out my wishes. There was a timidity of manner very inconsistent with that eagearness for a chance of a greatly stimulated trade in gas-cookers which one would naturally have looked for. In half apologetic tones they promised me they would do their best to meet my wishes. Later on, a prospectus of the series of lectures was sent me, most of the items of which were printed in French; but I was informed that the eminent lady lecturer whom they had engaged had graciously undertaken to devote one or two evenings to what I should term "every-day household cookery," described on the artistic programme in homely English. With this concession I had to be content, or else risk the success of the whole exhibition.

In course of time I saw the lady, and was not altogether surprised at the aforementioned hesitation as to asking for any modification of her set programme. As a mere man, I ought, of course, to consider a matter of such domestic concern as the cooking, &c., of food to be quite outside my legitimate domain. That the lady in question held this view most emphatically she took no pains to conceal; nor were evidences wanting that she had very strongly resented, and would continue to resent, my impertinent presumption in attempting to dictate the nature of the professional services she should render our patrons attending the exhibition lectures.

Readers will not be altogether surprised to learn that our exhibition was barely a day old before I came to realize that the "cookery lectures" would, in some important respects—from my point of view—prove an absolute failure. So seriously was this the case that I asked for, and very promptly obtained, the assistance, in a supplemental and quite private manner, of a local lady who, previously to her marriage, had never used a gas-cooker, and whose knowledge of its general utility was simply the natural outcome of intelligent perseverance for the best results in the ordinary every-day cooking of her humble household. The results of this assistance were two-fold. The interest aroused among the ladies by homely and well-browned cakes "baked in a gas-oven without burning," and in the mid-day meal for the staff of ten persons, cooked for 2½d., was really immense. The chagrin of the cookery expert was in like proportion. I do not know who was the better pleased when the lectures came to an end—the diploma'd lecturer or myself.

But who was to blame for this threatened fiasco? Possibly myself, for not having had more pluck; and for not, at the outset, revolting from what, to my mind—even at that time and infinitely more so now—was a species of "Petticoat Government" that has for many years handicapped most seriously the gathering-in of the best and most profitable fruits that should naturally follow a well-organized and well carried-out gas exhibition. But, of course, I preferred to blame the system as it then was, and still is, largely in vogue. It is this system which I have decided to attack now, and with vigour.

And Its Results.

The system is one which, as an advertising agency, might—if carried out to its full capabilities—be really efficient. But up to the present it is undeveloped; and it is, as usually practised, just the reverse of efficient. Chiefly because the methods adopted, though they may result in attaining the first object or aim of the advertisement—viz., attracting the attention of a certain section of the public—they are not adapted to instilling into the individual minds of the audience those facts to hear and to understand which the said public have been drawn together.

In case the foregoing remarks are a little too general or vague in terms, I will now particularize somewhat. My chief objections to the old system are two-fold: First, that the instruction usually given at these lectures is not such as (from the gas company's point of view, at all events) the customer stands most in need of; and, second (and conversely), that this instruction which, freely and universally given to the bulk of the gas consuming public, would create an enormous impetus to gas consumption is seldom given, and, in the majority of instances, is never given at all.

First, then, as to the instruction that *is* given. Just a glance through the programme of a week's lectures, afternoon and evening. Assume that every lecture is well attended by an interested and suitable audience; also that the various items are well discussed, and their *technique* thoroughly grasped by the majority of the ladies present—a very big assumption, too! Then let us consider how many of those scheduled confections will be prepared afterwards, and how often, by the customers on the district as a result of the demonstrations; and how much will the gas company's business be thereby really stimulated? And Echo answers "How much?"

Fancy or high-class cookery has no doubt its sphere of usefulness or, at all events, of application. But this sphere must be very limited indeed; and how it can be the duty of a gas undertaking to spend its money on the dissemination of knowledge in this particular department of gastronomical catering—without a chance of proportionate returns in increased gas sales—is beyond my comprehension, and always has been.

It may, and probably will, be contended that these lectures attract an audience which without them could not be drawn together, and that they thus tend materially to advertise gas for cooking; that they therefore, if indirectly, assist in the promotion of business. The lectures truly may appeal to the lady of the house, as providing tuition for her cook or her cook-general in attractive form without any expense to herself. Such functions are also invariably and graciously patronized by the leisured lady who is always on the lookout for a pleasant and comfortable way of spending the afternoon. But does the slightest material advantage arise, either to the industry or to the public as a whole, from such support as this? The answer is, I think, obvious.

Serious Omissions.

The second objection is the absence of the course of instruction which—at all events, to my thinking—can alone assist to any extent in the promotion of good business. The nature of the information must be such as appeals to the majority of our customers, or possible customers, and for application every day, or so often as the household cookery may be required. The information may, for convenience, be classified thus:

(*a*) As to adaptability of the gas-cooker for the whole of the culinary operation of the home, illustrated by numerous demonstrations of practical every-day home cookery, always metered so as to show the cost of the gas used. By this I mean the class of cooking which will inevitably be carried on every day and in every respectable home—by means of a coal-fire, an oil-stove, or a gas-cooker. And it is the business of the lecturer to show that the gas-cooker, of these three, provides the only means for securing the best results.

(*b*) As to the various conditions that go to make or mar the success of cookery by gas, illustrated practically in the arrangement by the lecturer of the various items of food in the oven; how the oven may be packed; how the grill should be used and not abused; the proper place and use of the hot plate; the class and shape of utensils, &c., &c.

(*c*) The correct control of the gas-burner, with practical illustrations again as to the amount of work that may be done for a stated consumption of gas, in small and also in larger units, as "what a penny can do," &c., &c.—to suit various households.

(*d*) As to time-work—showing how quickly, if necessary, food can be prepared for breakfast or for an emergency meal, &c.

Commendable exceptions there are to the time-honoured and traditional methods just described—references to some of which I have noticed with much pleasure in the "Journal," even since the foregoing lines were written. On the other hand, the practices complained of are still current in certain directions now under my own observation; and I am confident that, unless they give place to a course of instruction more on the lines just indicated, or on still better lines, the money spent on them is largely wasted, and with it also many golden opportunities for serving the public and the industry, to the mutual benefit of each.

(*To be continued.*)

The late Mr. Andrew Gillespie, of Glasgow, whose death was recorded in the "Journal" for the 27th of February last, left personal estate of the value of £7275.

At last Wednesday's meeting of the Evening Star Lodge, No. 1719, two candidates for initiation were balloted for—Mr. F. J. Bywater and Mr. R. B. G. Glover; and the ceremony will be performed at the Emergency Meeting of the Lodge to be held on the Monday of Gas Institution week—June 10.

We regret to learn that Mr. Levi Monk, who was for some years Engineer and Manager of the Lewes Gas Company (a position he relinquished in the summer of 1908), has sustained a bereavement by the death of his wife, which occurred at "The Birks," Hawick, on the 13th inst. The deceased lady was the eldest daughter of the late Alexander Carfrae, of Edinburgh.

One of the most prominent personalities in the Labour movement in the West Riding of Yorks. has been removed by the death of Mr. J. E. Smith, President of the Gas Workers' and General Labourers' Union of Great Britain and Ireland, which occurred last Thursday week at a nursing home in Leeds. He became a member of the Union for the Leeds district in 1889, was subsequently appointed Chairman of the Executive of the District Council, and in 1894 was appointed District Secretary. On the death of Mr. Pete Curran two years ago, he was chosen to succeed him as President of the Gas-Workers' Union; and he was the delegate to the General Federation of Trade Unions. Deceased was about fifty years of age.

FRENCH GAS-PURIFYING APPARATUS.

A patent has been taken out for France by the Compagnie pour la Fabrication des Compteurs et Matériel d'Usines à Gaz, of Paris, for a process and apparatus for purifying gas.

The introductory remarks in the specification of the patent point out that the efficiency of gas-purifying plant depends entirely upon the quantity of material employed, and the loss of pressure caused by the passing of the gas through it. The first factor should, it is said, be as great, and the second as small, as possible. It would therefore be advantageous to fill purifiers as completely as practicable, and decrease the space occupied by the material, the inlets and outlets of the gas, &c. It is submitted that the systems now in use only partially meet these requirements. The simplest device would be to fill the purifier, and send the gas through it in any direction; but this is impossible, because by employing very thick layers of material the lower parts would be too compressed, and would consequently obstruct the passage of the gas. The necessity for having only a slight loss of pressure has led to the construction of the "Compound" purifiers, in which the gas is divided into two or more currents when passing through the material.

The present invention relates to a process and device for purifying gas which, it is claimed, possesses the advantage of giving a maximum amount of material with a minimum loss of pressure. An example of the plant is given in the accompanying illustrations. Fig. 1 is a vertical and longitudinal section of the purifier; fig. 2, a transverse section through the line X of fig. 1; fig. 3 is a detail of fig. 2, on a larger scale; and fig. 4 is a transverse section through the line Y of fig. 3.

Fig. 1.

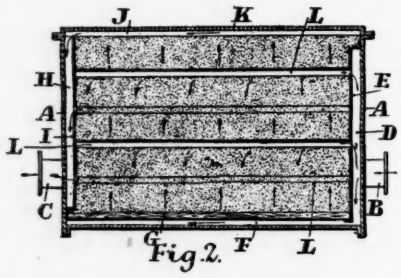


Fig. 2.

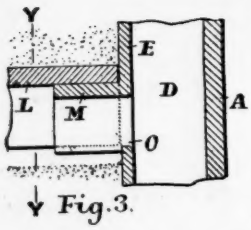


Fig. 3.

Fig. 4.

The purifier-box A has upon its sides an inlet B and an outlet C for the gas. The inlet-pipe runs into a vertical collector D between the corresponding side of the purifier and an inner partition E. This collector communicates with a horizontal chamber F between the bottom of the purifier and a grid G, the bars of which run from the inner partition to the outlet side of the purifier. The pipe C runs from a vertical collector H, between the corresponding side of the purifier and an inner partition I. This collector is closed in the lower part, and communicates above with a chamber J under the purifier lid K. There are inverted gutters or channels between the inner partitions E and I. These channels are arranged zig-zag fashion on horizontal rows, suitably spaced. While the purifier is being filled with material, it forms in natural slopes along each side of the channels.

To facilitate mounting, the channels rest at their extremities on supports M fixed on each partition; and some are provided with openings O in the under part to allow gas to pass. Loss of pressure can be varied as desired by a suitable arrangement of the channels.

The flow of the gas through the purifier is indicated by the arrows in figs. 1 and 2. The gas entering by the pipe B fills first the collector D, and afterwards the chamber F. From the collector the gas flows into the different tunnels, and spreads out in uniformly divided layers in the purifying material. It then passes through the tunnels communicating with the outlet chamber. The gas from the chamber F, passing through the grids, follows a similar course through the purifying material.

COMBINED GAS-FLOW GOVERNOR AND GAUGE.

Towards the close of last year, a paper was read before the University of Durham Philosophical Society, by Mr. S. H. Collins, M.Sc., in which he described a combined governor and gauge for maintaining a regular flow of gas, and a thermostat with a delicate adjustment and long range. The paper, with illustrations of the apparatus, is published in the current number of the "Chemical News," from which we reproduce it.

In the course of some investigations on the rate of evaporation of hydrocyanic acid gas from aqueous solutions, a regular flow of gas was required, and it became necessary to use governors and pressure-gauges. At first the apparatus used in testing coal gas was employed; but it proved too clumsy for the special use to which it was put. Ultimately a simple glass apparatus (fig. 1) was devised, which is now described.

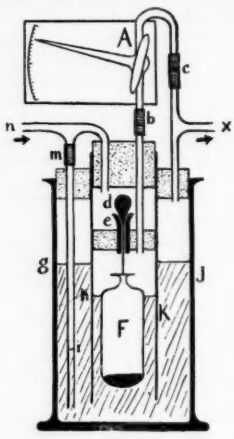


Fig. 1.

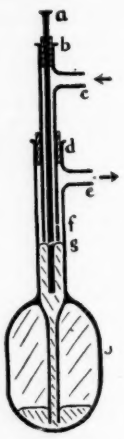


Fig. 2.

A is a glass tap with long pointer and scale mounted on a wooden block; *b*, *c*, and *m* are rubber connections; *d* is a piece of glass rod drawn out with a long tail; *e* is a piece of glass Sprengel tube blown with a bulb at one end and then ground down; F is a float weighted with mercury, and having a platform of flat glass cemented on; K is a piece of wide glass tube; and J is a glass cylindrical jar. The point of entry of the gas is at *n*, and the point of exit at X. When at work, the pressure of the incoming gas depresses the water in the pressure-tube to *i*; but the gas does not go through this tube, but flows on into the chamber containing the valve made by *d* and *e*. The rate at which the gas passes through this valve depends on the position of the float F, which is kept hovering about a position determined by the level *h* according to the exact dimension of the instrument. The level of water *g* is dependent on the amount placed in the jar J, and is easily adjusted before operations commence. The height *g h* is, in consequence, fixed once for all. The height *g i* shows the pressures of the incoming gas; and the height *h i*, the surplus pressure which is being got rid of by the valve *d e*, and which is liable to variations due to any irregular action in the apparatus.

As the difference of pressure on the two sides of the tap is kept constant, and the tap is fixed by trial, both pressure and resistance are constant, and therefore current is constant also, unless the specific gravity of the gas should vary. Within certain limits, the pressures and resistances before *n* and after X may vary; but the current of gas remains constant.

The records from 22 actual runs with the instrument show an average flow of 10·05 ± 0·22 litres of gas per hour, when 10 litres was the flow required. This rate includes stopping and starting, and long intervals of one or two hours without attention.

In the diagram of the thermostat (fig. 2), *a* is a thin glass rod; *c* is a T-piece with bye-pass at *f*; *b* and *d* are thin strips of writing-paper twisted two or three times round. The remainder of the apparatus is the ordinary body of a thermostat. The rod *a* serves as the fine adjustment, and renders unnecessary the restriction commonly placed at *g*. The rod and tubes fit one another fairly closely, so that the cross section of mercury at *g* is small. The close fit is rendered possible by the use at *b* and *d* of paper coils instead of corks. Experience shows that these paper coils are quite gas-tight. The T-piece *c* serves as coarse adjustment, gas inlet, and bye-pass. The bulb contains mercury and toluene or other organic liquid with high coefficient of expansion. The bulb may be made long and narrow if required. The thin glass rod *a* may be replaced by a knitting-needle. In use, the T-piece *c* is approximately adjusted, and then the rod *a* moved up and down for fine adjustment.

THE "SWITCH-ON" ELECTRIC GAS-LIGHTING SYSTEM.

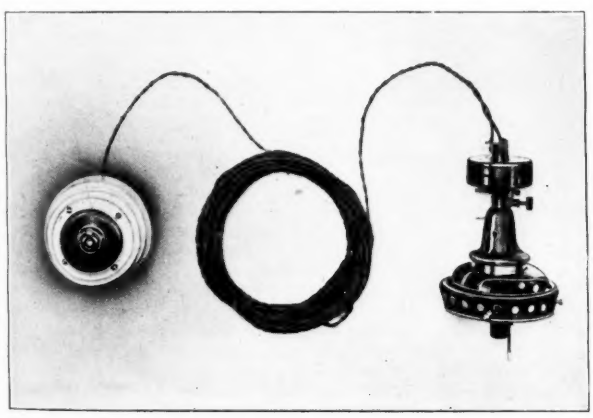
A Simple and Readily Installed Appliance.

THE several advantages that gas lighting possesses over electric lighting in the way of the quality of light, the lower intrinsic brilliancy, which therefore causes it to be less injurious to the eyes, the natural power that it possesses in keeping the air of rooms in motion, and therefore assisting in producing ventilation, and its economy in the matter of cost light for light, have only the one disadvantage set against them in the comparison, and that is—unless the burners are fitted with some means of lighting and extinguishing by merely operating a switch or pressing a button—the absence of the convenience of prompt ignition and extinguishing without trouble. There is no reason to-day why the ease of control in the matter of lighting and extinguishing that is admittedly possessed by the electric light should not be adopted by gas consumers; and to obtain this convenience there is no need to go to the expense, trouble, and nuisance of having the gas-fittings taken out, and the house completely wired and electric fittings installed. It is an unnecessary and a costly method of obtaining this single convenience, which brings in its train the disadvantages of an inferior light from the physiological standpoint.

Such gas igniting and extinguishing appliances demand for their characteristics simplicity, reliability, and a promising permanence; and these characteristics are found in the patented system that is being introduced by the Switch-On Gas-Lighting Syndicate, Limited, of No. 31, Budge Row, Cannon Street, E.C. We have examined the new arrangement, and can vouch for its simplicity, and the promise of a good life; and as to the reliability, it has been put to varied tests, and in not a single instance was there any hesitation on the part of the burners in responding to the operation of switch or push with a smartness that vies with electric lamp lighting and extinction.

SINGLE SWITCH AND BATTERY.

The first novelty that claimed attention was a switch on a base, enclosed in which is a small battery; so that the whole thing is self-contained. In outward appearance, this is precisely the same as the electric light tumbler switch, but the base block is somewhat larger, though not by any means unsightly, in view of the fact that it serves as the case for the battery. This is supplied



The "Switch-On" Lighting and Extinguishing Combination Set.

complete in a set, with 12 yards of wire, and valve for burner, bye-pass jet, and (unless preferred otherwise) with burner already fitted for installation. There is one point that may be mentioned at once, as it applies generally to the system; and it is that it can be applied to any ordinary burner on the market—inverted or upright, large, medium, or bijou sizes, or to shop lamps, or lamps used in any other large indoor installation. The field for the system, it will be obvious, is large.

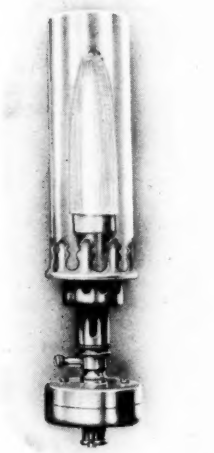
But to return to the single-light switch and battery combined. This can be easily fitted by any intelligent consumer. The combination, as we saw it, will be slightly altered for the convenience of the user. In the present types, the switch cover has, in fixing, to be taken off by removing four small brass screws. Thus the battery is exposed. This is simply lifted out; and then the base is fastened to the wall through the holes provided in the base. The battery is put back, the cover replaced, and this part of the installation is accomplished. From extended tests made of the battery, it is calculated that it will run at least eighteen months—probably longer—with ordinary use; and the battery can be renewed at a cost of a few pence. The flexible wire is already attached; but a word may be said here as to the wire used for the system. It is specially made for it. The outer cover is coloured light gold; and the inner covering is coloured in various shades to assist in installation, so that, by following the instructions and the markings at the terminals, no error can be made in producing accuracy in fitting-up. Everything is plain and straight-sailing. Insulated staples are supplied for running the wire, in order that no damage shall be done to the insulation of the latter. Clips are also provided for affixing the wires to the pendants or brackets; and a neat job it makes. There is nothing unsightly about it. As a matter of fact, if properly and neatly done, the gold covered wire rather adds to than detracts from the look of the fitting.

The Push-Button Switch.

THE VALVE.

We come to the valve, which is fitted above an inverted burner, or below an upright one. This being the vital part of the system, close inspection was made of it. It is of very simple construction, and made in the Syndicate's own workshops. The casing, which is either of lacquered brass or oxidized copper, is cylindrical, flat top and bottom, small, and strongly made. It is fitted with permanent ring magnets and wound relays; and there is always a slight amount of permanent magnetism present. A spring keeps the valve shut. When the switch is operated, the current passes through the magnets, and, these being excited, causes a small diaphragm valve to rise or fall as the case may be with vertical or inverted burners. The gas then passes freely through the valve to the burner. When the switch is again operated, the magnets are demagnetized, the valve comes into operation again, and the

The Valve Fitted to an Inverted Burner.



The Valve Fitted to a Vertical Burner.

gas is cut off. There is no waste of electrical energy all the time the gas is alight; current only passes at the moment of contact with the switch—a sort of residuary magnetism keeping the valve in position, and allowing the gas to pass to the burner. That is the whole of the organism and operation of the valve; and there is nothing about it that the gas can affect. As proof of its efficiency, the information was given, at the date of inspection, that the device had been working six months on both inverted and vertical burners without a single hitch. There is a convenient arrangement in the event of anything going wrong with the switch, or in the event of the battery becoming exhausted. This is a simple push at the bottom of the valve, pressure by the hand on which will operate the valve and allow gas to flow through to the burner. Thus the contingency of a breakdown is provided for.

FITTING A NUMBER OF LIGHTS IN ONE ROOM.

In a room where there are several lights—say, a multi-light pendant and some side lights, or a number of the latter and no pendant—it simplifies matters in installation to have each room equipped with its own small battery, which forms the base for the switches. This is frequently found better than having one large battery for a whole house. The pushes are mounted on a white enamelled wood base; and are quite diminutive things—not having a battery incorporated with them, as in the single-light switch. The pushes can be made to control any number of lights; but, as the number required at different times in any room is variable, it is better to have more than one wall push controlling them. Say a three-light pendant is fitted, it is convenient to have one push controlling two of the burners, and one the remaining burner. In this way one, two, or three lights can be employed just as is needed. The number controlled by any single push is

entirely at the option of the consumer when the installation is made, or it is quite easy to effect subsequent alterations. At the offices of the Syndicate, burners were seen fitted up in varied number and ways; and severe and very rapid tests showed the sensitiveness of the valve arrangement and the quick response to the demand for light, or its extinction. These push-switches have the buttons marked "On" and "Off." Pressing the "On" button has the effect of opening the valve; it cannot do anything else. When the "Off" button is pressed, the valve closes; there is absolutely no chance of the gas being left on. The simplicity of the whole arrangement will secure favour for it.

A New Flash-Light Sign.

Gas companies have not hitherto adopted flash-light signs to any great extent for their show-rooms, though their advertising value cannot be gainsaid. Such signs fixed outside the gas show-room must lead to business among local tradesmen. The valves of the Switch-On Lighting Syndicate which we have described lend themselves admirably to this business. A battery with mechanism attached to operate a switch, the valve attached to an incandescent burner inside the casing of a sign, any coloured glass chimney or globe over the mantle to give the desired colour to the lettering in the case (several coloured glasses could be kept by the user so as to change the colours night by night); and there one has a really workable and dependable sign. The casing is neat, and can be made in any form, with the lettering cut in it, and an opal glass backing inside the casing. That is the extent of the arrangement. It will be appreciated how readily small signs can be made to surround an ordinary burner fitted with the "Switch-On" system for the interior of a shop window. The signs work so that one gets the sudden effects—sharp brightness, and sharp darkness—that are obtained by electric lighting. The sharp contrast is what arrests the eye—more than the slow appearance of the lettering, and its slow disappearance, as though life was being given to the sign against its will, and that light was equally reluctant to depart when it had attained its full useful vigour. The sign requires no attention, beyond setting it to work at night time, and discontinuing it as soon as outside traffic is suspended. It is a cheap combination, and cheap to work; and therefore there should be a good market for it. One outdoor sign seen at the office of the Syndicate bears the wording on the three sides "Switch on Your Gas Electrically." An example of a shop window interior sign says, "Switch on Your Gas, and Save Mantles and Matches. Like Electric Light."

A Large Undeveloped Field.

There is a large undeveloped field for lighting and extinguishing devices in the gas-supply industry, as well as for advertising signs. They give to gas lighting the one advantage of convenience for which electricity has been able to claim superiority, though gas has the superior position in relation to the qualities mentioned in the opening lines of this article. In short, with switch or press-button lighting and extinguishing arrangements, gas lighting in its modern form can claim equality with electricity in the matter of convenience, and superiority in all other respects.

GAS AS AN ILLUMINANT.

This was the subject of a lecture by Mr. Van Rensselaer Lansingh, delivered at the recent celebration, in Philadelphia, of the centenary of the introduction of gas as an illuminant. It was divided into two parts, in the first of which the lecturer gave a brief historical account of gas lighting, and in the second reviewed the art as it is known to-day. The following are the principal portions of the lecture.

Historical.

The lecturer began by pointing out that until the introduction of gas as an illuminant in the early part of the Nineteenth Century but little progress had been made in the art of lighting from the earliest prehistoric days. The most notable advances so far had, he said, been in the introduction of the sperm candle and the use of the argand burner with oil-lamps. With the introduction of gas, however, a vast stride forward was taken, which far outranked all other progress so far made in the art of artificial lighting. In order to appreciate the importance of this discovery, he passed in review the history of lighting up to that time.

The beginnings of artificial illumination go back to the time when man first made fire; and the old camp-fire not only served to cook the simple meal, furnish warmth for the savage, and keep away the wild beasts, but it also gave him sufficient light to meet all the necessary requirements of the time. For many centuries burning wood continued to be the only means of lighting. From the bonfire developed the fire-brand and the pine torch; and even as late as the days of Homer, the Greek knew no other light than that of the flaming torch of pine wood. After a time, however, man began to recognize the luminous power of animal and vegetable fat; and then the first step was taken away from the pine torch. At first tallow was burnt in open dishes; but later a cotton wick was inserted. The next step was the invention of the candle; and this illuminating agent was in general use at the end of the Eighteenth Century. The first part of the Nineteenth Century, however, witnessed a great change in candle manufacture—viz., the introduction of the method of casting instead of that of dipping. This made a much neater candle; and the inconvenience of having to trim it has been recently done away with. But by the time the candle had reached this stage of perfection, it had long been outrivalled by other means of lighting—first by oil-lamps, and then by gas and electricity. It is interesting to note, however, that, despite the introduction of these two illuminants, the use of oil-lamps and the consumption of oil are greater than ever they have been.

The introduction in a community of lighting which could be supplied and operated from a central source, with nothing for the individual to do but to turn on the light when he wanted to use it, marks the greatest era in all the history of artificial illumination. It is the advent of this era, one hundred years ago, that we are now celebrating. It must not be supposed that the first gas-light was made or used only a hundred years ago; but the year 1812 marks the time when the first company for supplying the public with gas started operations. Prior to that time, a number of individuals had experimented with gas-lights very successfully; the best known of these being Murdoch, Lebon, and Winsor. In 1812, however, a Royal Charter was granted to the London and Westminster Gaslight and Coke Company (this being the first gas company formed); and in 1816 the first gas company in the United States was incorporated at Baltimore. From that time onwards the introduction of gas into the different cities of the world was rapid; but their history need not be taken up further.

Burners.

The first burner used by Murdoch consisted of a small iron tube open at the end; but he substituted for it a closed tube in which were three small holes giving divergent jets. It had less than one candle power per cubic foot of gas consumed. This, however, was soon followed by the batswing burner, giving a broad, but not high, flame. In 1820, the fishtail burner was invented by Neilson, of Glasgow. In the earliest days of gas lighting, the burner invented by Argand in 1784 for use with oil was adapted for gas, and was for a long time the standard; but it was eventually superseded in most places by a flat-flame burner. In 1853, Sir Edward Frankland invented the regenerative burner, which is essentially an argand burner in which the products of combustion are used to heat both the gas and air supply. This preheating of the air and gas allowed a high temperature to be reached; and inasmuch as the light depends upon the temperature of the carbon particles, a very much greater efficiency was obtained by this method. Mr. Siemens, in 1879, improved on this; and his type of burner is still in use in certain places, though rapidly being replaced by the inverted mantle burner. Up to the time of the introduction of the Welsbach mantle, we find the following efficiencies of the different types of burners with coal gas of 16-candle power: Flat-flame, 0·6 to 2·5; argand, 2·75 to 3·2; regenerative, 7 to 10. The regenerative burner could be forced to considerably higher efficiency than this were it not for the inability of the parts composing the lamp to withstand the intense heat.

Mantle Burners.

The entire gas-lighting industry was revolutionized by the invention of mantle burners by Dr. Auer von Welsbach in 1885. It is interesting to note, however, that many attempts along the same lines had been previously made. In 1826, Gurney employed a cylinder of lime on which he played an oxy-hydrogen flame. This never proved a commercial success, though an attempt was made to use a modified form in Paris with oxy-coal gas. Gaillard, in 1840, made a mantle of platinum gauze; but, owing to erosion caused by the gases, its life was short, and the plan was never commercially put into practice. The next step was that taken in 1855 by Bunsen, who produced the well-known non-luminous flame by mixing coal gas and air before ignition. M. Ciamond, in 1882, devised a basket or cone of threads of calcium magnesia supported by a platinum wire cage, and by means of a blowpipe and bunsen burner heated it to high incandescence.

Flat-Flame Burners.

Flat-flame burners are rapidly going out of use, except in special instances where the light is used more for a marker than for the amount of illumination given off, or where the burner is subject to such hard usage as to render the employment of a mantle burner inadvisable. The flame from an open gas-burner appears to be practically transparent to light, as the horizontal distribution curve of such a flame is practically uniform. This is also true of the vertical illumination curve, with the exception of the slight shadow cast by the tip. In other words, the horizontal candle power as ordinarily measured, whether in a plane with that of the flame or at right angles to it, practically measures the mean spherical candle power of such a unit. Burners of this type are generally used with some form of globe to protect them from draughts. The effect of such glassware is usually to throw considerable light upwards, so that where the light is wanted below the horizontal, a burner of this type is inefficient as ordinarily employed.

Upright Mantle Burners.

These burners have been greatly developed since their first introduction in 1886. In the early days there was a decidedly greenish tinge to the light; and even to-day in most of the mantles this defect is quite noticeable, especially in comparison with other sources of light. This has, however, been more or less rectified; and it is possible to-day to buy mantles which have considerable variation in colour, One of the drawbacks to the mantle burner

has been that till recently only one size of mantle was available—viz., one about 3½ inches high, giving a rated horizontal illuminating power of from 60 to 80 candles. At the present time, however, a smaller mantle is available; so that it is possible to get a wider variation. This has been one of the chief drawbacks of gas lighting as compared with electric lighting—viz., the lack of different sized lamps. Efforts to overcome these objections seem to be making progress in both upright and inverted burners; and it is likely that in the near future this advantage of electricity will be largely done away with.

An important point in gas lighting, more especially with mantle burners, is the effect of pressure and also of the quality of gas on the light. Gas lighting would be much improved if burners were selected with reference to this point, as electric lamps are selected for different pressures in various districts. The manager of a modern central electric station measures the voltage pressure at different parts of its circuits, and buys his lamps accordingly—thereby furnishing proper lamps to the customer. In this way a great deal of complaint as regards poor service, &c., is done away with. If the gas companies followed the same plan, they would undoubtedly have a better satisfied class of customers, which is the best asset a gas company could have. Moreover, in this connection it is interesting to note that mantle burners are seldom or never bought on specifications. When the electric light company furnish lamps to their customers, it is only after they have been bought on rigid specifications, and have actually been tested to find out whether or not they comply with the requirements. In gas lighting, however, it is the usual policy of the gas company to furnish mantles and burners to their customers at all prices and grades; leaving the customer to select whatever, in his opinion, he sees fit to buy. The result is that the poorest and cheapest burners and mantles are most often found on the gas company's mains—resulting in the dissatisfaction of the customer, and making him comparatively ready to change to electric lighting when opportunity offers. It would seem that, if gas companies are to retain their customers for lighting purposes, it is necessary to take some steps along this line, as, with the introduction of the tungsten filament lamp, the mantle burner, especially under poor operating conditions, can no longer hope to compete so successfully as in the past.

With the upright mantle burner, the distribution of light is considerably different from that of the open-flame burner, which, as already shown, gives practically spherical distribution. The upright mantle burner gives its maximum light on the horizontal, and comparatively little light directly underneath. Practically half the light is above the horizontal and the other half below. From the standpoint, therefore, of ordinary lighting, it is desirable to change its distribution. The ordinary shades as used with the mantle burner often accomplish their purpose of diffusion more or less successfully, but fail to send the light again in directions below the horizontal. As a matter of fact, most upright burners, when equipped with diffusing glassware, throw two-thirds of their light above the horizontal; and unless the walls and ceiling are extremely light, a large amount of flux is lost. Consequently, the upright mantle burner is, generally speaking, not well adapted to utilize most of the light.

Inverted Mantle Burners.

Lamps should be rated in terms of their total flux, rather than their mean horizontal candle power, if comparative figures are to be obtained. From an illumination standpoint, the important things about a lamp are the total quantity of light given out and its distribution. The importance of this was not realized in the gas industry until the introduction of the inverted burner. The standard inverted burner gives about 67 per cent. of its light below and only 33 per cent. above the horizontal. This should be compared with the standard upright burner, which gives 55 per cent. above and 45 per cent. below. It means for the same total flux of light an increase of nearly 50 per cent. in the light below the horizontal; and if this is taken as the useful light (as is often the case, but not by any means always), it marks a great increase. Moreover, any glassware which is used with inverted burners is apt to increase rather than decrease the flux below the horizontal, especially if the glassware is of the open type; so that at the very start we have a marked increase in the net efficiency of the inverted as compared with the upright burner. In addition to this, the burner itself is slightly more efficient. Owing, furthermore, to the fact that the inverted burner lends itself more easily to artistic effects, and is less likely to blacken the ceiling, as it can be placed lower, it has come rapidly into use. With the introduction of this burner, many new kinds of glassware have been devised for it. Among them may be mentioned those of the prismatic type, which are now available with the standard inverted mantle burner, so as to give the three typical distribution curves—extensive, intensive, and focussing—which are found to fit the requirements of many installations. The difficulty of breakage in connection with the use of pressed glassware has been largely obviated by the employment of a metal collar. We can therefore safely state that, with the improvements which have already been made, it is possible with gas to duplicate nearly all the effects which can be obtained with electric lighting, both as regards ornamentation, distribution, ease of control, &c., and even surpass it in cheapness of operation.

Gas Arc Lighting.

The gas arc has been an attempt to obtain a large unit of high candle power where a considerable flux of light is wanted. Owing to the size of the unit, it has generally been thought to be highly efficient; but, owing to causes which it is not necessary to enumerate, it may be stated that the gas arc is no more efficient than the individual burner, even if it is as efficient. We can therefore consider a gas arc to be nothing more nor less than a large upright or inverted burner; and most of the remarks which have already been made as regards these can equally well be applied to the gas arc.

Diffusion.

One of the most important considerations in connection with mantle burner lighting is that of diffusion. When our only forms of burners were those of the argand or the open-flame type, the necessity for diffusion was not great, as the candle power per square inch was not in excess of five. However, with the introduction of the mantle burner, having far greater intensity, and, in addition, giving a much larger quantity of light, it became necessary not only to shield the eye in order to protect it from harm, but also to enable it to work with a widely pupilary aperture, and thus to see better. It is recognized now as one of the fundamental principles of good lighting that the light must be well diffused; and it is interesting to note that the passing of the bare mantle burner is becoming exceedingly rapid.

High-Pressure Gas Lighting.

The ordinary pressures as used in gas lighting are from 5-10ths of an inch at the burner up to perhaps 2 inches. Flat-flame gas-burners work best on comparatively low pressures; but with the mantle burners, higher ones are more suitable. It was soon found that an increase in light could be obtained by using higher pressures. For street lighting, therefore, it was logical that experiments should be made along these lines. The result has been the introduction of high-pressure gas-burners principally for street lighting. With the ordinary low pressure in either the inverted or the upright burner the illuminating power per cubic foot is about 20 candles; whereas with high pressure this can be increased from two to two-and-a-half times. High pressure is adapted for either upright or inverted lighting; but, owing to the superior distribution obtained with the inverted burner, this is rapidly supplanting the upright type. It is interesting to note that the curve of distribution in the high-pressure burner is somewhat flatter than in the ordinary inverted low-pressure burner—a point particularly well adapted for street lighting. Local conditions being considerably different in America from those abroad, it has not been adopted to any extent in America, though it is likely to have a much wider use than at present. Owing to the extreme intensity of the mantle, it would seem necessary to have some means for diffusion; and though this is not so important in street lighting as in indoor work, it will undoubtedly soon become one of the first requirements.

Methods of Gas Ignition.

The ordinary method of lighting gas is by striking a match; but, owing to this inconvenience, many different schemes have been adopted. The most common of these is the pilot-light, consisting of a bye-pass which allows a small quantity of gas to pass round the burner. This pilot-light burns continually, and whenever the main supply of gas is turned on, it lights the mantle. The gas can be turned on either by moving the gas-cock by hand or else by a pneumatic valve control. When properly installed, the control system is well adapted for this purpose, and does for the gas what the electric switch does for electricity. Another method of ignition is that by the "jump spark" system, which has been in use for many years. Still another method of ignition is by a catalytic process. Advantage is taken of the well-known quality of platinum sponge to occlude gases. This is placed on the mantle, and when the gas is turned on, the platinum sponge begins to glow, and rises to a sufficient temperature to ignite the gas. Many efforts have been made to introduce this form commercially, but up to the present time not very successfully.

General.

To one familiar with what has been accomplished in this field, one of the most astonishing things in the gas situation is the lack of standardization. It is true that a good deal has been accomplished along this line within the last year or so; but there is still much to be desired. The writer would suggest some of the following steps to obtain improvements in gas lighting:

1.—Greater range in the size of the units to meet better the requirements of all classes of light, both in upright and inverted burners.

2.—More reliable methods of commercially rating gas-lamps, so that when specifications are drawn up by the illuminating engineer or the architect, giving certain definite illumination requirements, he can be reasonably sure of obtaining exactly what he wishes.

3.—The lamp should be standardized similarly to the present methods of standardization of electric incandescent lamps.

4.—Holders or fitters should be changed to conform to electric practice. Thus the gas fitter is 3⅜ inches in diameter; whereas the standard electric fitter is 3¼ inches. Holders 2¼ inches diameter are common to both gas and electric globes.

In a lecture of this length, it is impossible to more than very briefly sketch the historical and present state of the art of illumination. Reference must be made to what has already been published on the subject.

ENGINEERING FEATURES IN THE DESIGN OF A LARGE GASHOLDER.

The following article, on the design and construction of the ten million cubic feet gasholder at the Kingsbridge station of the Consolidated Gas Company of New York, was communicated to a recent number of "Engineering Record" by Mr. HERBERT W. ALRICH, of the Engineering Department of the Company. Other contributions by the author to the literature of gasholder and tank construction have, as readers are aware, lately appeared in the "JOURNAL;" and the present article forms an interesting supplement to them.

Though among the prominent engineering structures of New York are its giant gasholders, the engineering profession at large is little informed as to the principles governing their design and construction. The majority of engineers are somewhat familiar with the theory of higher framed structures, and hence have some knowledge of what is involved in the design of a large bridge or the steel frame of a many-storeyed building. It is also true that an engineer may quite readily undertake the planning of some types of structures in the design of which he had not previously engaged; but this does not apply to a large gasholder. It is even probable that the manner in which the telescopic action of a gasholder is accomplished is shrouded in mystery to all but a few.

GENERAL FEATURES OF A GASHOLDER.

A gasholder is composed of three main parts, each of which in its functions is distinct from the others, and even represents a materially different character of construction. First is the tank, which contains water of sufficient depth to submerge the sections of the holder proper when they are not filled with gas and rest upon the bottom of the tank. Second is the holder proper, which consists in the present case of five cylindrical steel shells, varying in diameter by increments of 2 ft. 9 in. These shells are located concentrically within the tank, and are open at both ends, except that the upper end of the innermost section is enclosed by a spherical crown. Each section except the outer one has an annular cup constructed around its lower edge, and correspondingly each section except the inner one has a grip formed around its upper edge; the cup of one section being proportioned to engage the grip of the next outer section. Thus the inflowing gas acts upon the crown of the inner section, causing it to rise until the cup formed round the lower edge of that shell engages the grip around the top of the next succeeding section, when it, too, is lifted. This action continues with respect to the other sections until the entire holder is inflated with gas, and the lowest or outer section remains submerged in the water contained in the tank to the extent necessary to form a seal against the escape of the gas. These shells are guided in their telescopic action with relation to each other by rollers spaced around the lower edges of the shells, which act upon vertical rails provided upon the interior of the sections and the interior of the tank. The third main part of the holder is the guide-frame, upon the rails of which the rollers carried by goose-necks at equidistant points around the upper edges of the holder shells travel as the sections move up or down in response to the inflowing or the outflowing of the gas.

STRESSES.

The principal stress to be considered in the design of the tank is the internal hydrostatic pressure, though in addition the tank is subjected to the distorting tendency of the guide-frame, which is attached to and supported by the tank shell. The stresses developed in the gasholder sections are somewhat more complicated than those in the tank, and also less susceptible to computation. The principal stresses are those developed in the circular girder at the point where the crown of the inner section is joined to the side plating. The upward pressure against the crown is that due to the weight of all the sections, less the weight of the crown itself and *plus* the weight ot the water carried in the hydraulic cups which form the seals between the sections. As the crown is the segment of a sphere, the resultant of the tension in the crown plating and the weight suspended from its outer edge is a horizontal inward force. This circular girder is also subjected to forces tending to distort it, which are developed by the goose-necks attached to the outer edge of the crown. The thrust applied through these goose-necks tends either to roll the circular girder inward or to distort it horizontally, depending upon their angular relation to the direction of the wind.

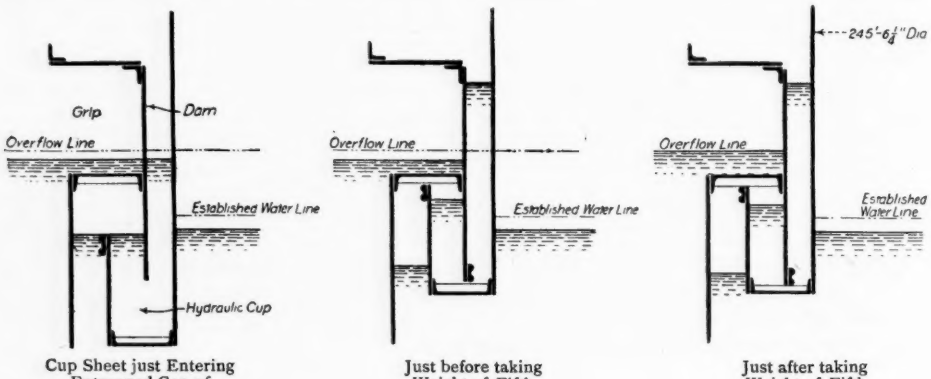
Further, if the circular girder were insufficiently rigid with relation to the crown, the maximum stress conditions would result in its being rolled outwards, jamming the rollers against the guide-rails; or if it should be insufficiently rigid with relation to the side of the shell, or if the resultant of all the forces acting upon it bears an unfavourable relation to the neutral axis, the girder will be rolled inward, swinging the goose-necks through a sufficient arc to cause both the radial and the tangential rollers to leave the guide-rails.

Each radial element of the hydraulic cup formed round the lower edge of the four inner sections is subjected to a polar moment, resulting from the suspended weight and from the reaction against the outer sections of the internal rollers attached to the under side of the cup. The resultant of the moment on all these elements round the perimeter is a circumferential compression. Likewise each radial element of the grips which are formed round the tops of the four outer sections is subjected to a polar moment, developed by the suspended weight, the resultant of which moment round the entire perimeter is a tension which tends to rupture the dip sheet of the grip. The grips must also resist the distorting forces imposed upon them by the attached goose-necks, the tendency of which is dependent upon the angular relation of the several goose-necks to the wind.

The stresses developed in the guide-frame are those which result from the wind blowing against the fully inflated holder sections, and transmitted to the frame through the guide-rollers on the goose-necks. The latter and their corresponding guide-rails in pairs occupy varying angular relations to the direction of the wind—resulting in an accumulation of stresses at two portions of the circumference greatly in excess of those which exist simultaneously at any other part of the perimeter. However, as the wind may blow from any quarter, all the panels in the same tier must be designed for the maximum condition.

To determine accurately the distribution of the wind stresses around the circumference requires an analysis of the elastic behaviour of the structure as a whole; otherwise there might result sufficient deflections of some guide-rails to hinder the free movement of the rollers. When the gasholder is entirely deflated, and the guide-frame stands alone, the wind pressure, though less in amount than before, is exerted against the structure in a manner which it may resist to far less advantage. For while the pressure against the area of the holder sections is many times greater than that against the guide-frame alone, it is transmitted to the guide-frame in a manner susceptible of determination, and under circumstances favourable to effective resistance from the diagonal and horizontal members. But when the wind blows against the bare guide-frame, its pressure is applied without relation to the system of bracing employed in the design of the structure.

It is thus apparent that the related functions of the three main parts of a gasholder might be accomplished by using large masses of steel which would provide complete rigidity for the structure as a whole. But this would be economically impossible, and would be opposed by numerous practical considerations. The proper design requires that distribution of minimum amounts of metal which will permit a satisfactory operation of the holder without the freedom of its movement being disturbed either by distortions of the bulky holder sections or the web-like guide-frame. To obtain this result requires a definite determination of the extent to which each member participates in the work of resistance, a comprehensive study of the elastic behaviour of the steel in its fabricated forms, and the guidance of experience. The probable



Cup Sheet just Entering Entrapped Gas of Fifth Section.

Just before taking Weight of Fifth Section.

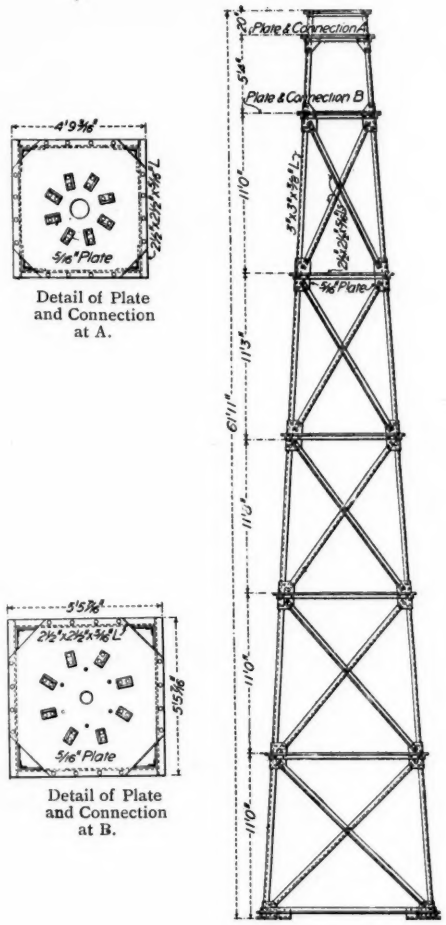
Just after taking Weight of Fifth Section.

Diagrams Showing the Stages of Cupping.

penalty for a material miscalculation would be reconstruction; while in the case of bridges and buildings, errors may be remedied with comparative ease. From this discussion, it will be seen that the design and construction of a large gasholder require special knowledge and skill which reserve the work to but a few firms of known qualifications and responsibility, and substantially remove it from the field of competition.

The Tank.

When the construction of the holder about to be described was first contemplated, there was considered the advisability of constructing the tank of concrete, of a type similar to that of the 15 million cubic feet holder at Astoria. The relative merits of concrete and steel tanks were carefully compared, with the conclusion that in this case there was considerable advantage in favour of steel construction.* The determination of the diameter and depth was the result of analyzing many conflicting elements.



Detail of Plate and Connection at A.

Detail of Plate and Connection at B.

Centre Post of Crown Support.

Preliminary study showed that the diameter might reasonably vary between the limits of 245 feet and 270 feet. If the diameter should be made relatively large, the thickness required for the plates would be kept down to that which the manufacturers can roll with the best results. The height of the structure would also be somewhat reduced and its stability thereby increased. The disadvantages of a large diameter were the increased cost of foundations, owing to the greater area, and the difficulty of providing a site of sufficient size. Further, the large diameter would result in shallow sections, with consequential danger of the inner section getting jammed in the guide-rails when it alone was inflated.

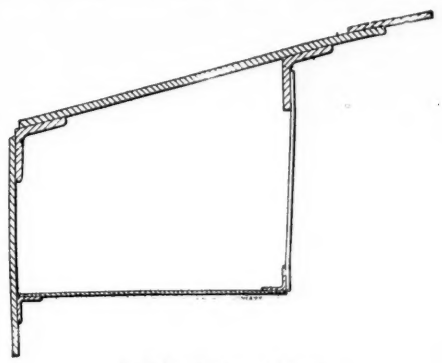
With the smaller diameter of tank, there would be a corresponding ease in securing a site wide enough to receive the holder, the cost of the foundations would be materially reduced, and the inner section would be of such proportions as would produce a proper relation between its centre of buoyancy and centre of gravity. However, such a tank would require plates of a thickness to which the manufacturers would reluctantly extend their fullest guarantee. The entire structure would be of abnormal height, with a corresponding increase in the wind stresses; and the outer sections of the holder proper would be of an excessive depth, tending to make them flabby and unstable when resting upon the bottom of the tank. It was concluded from this study that the most advantageous proportions were a diameter of 251 ft. 3 in. and a depth of 46 ft. 4 in.

* Reference may be made to the author's paper, on "Steel or Concrete for Gasholder Tanks," in the "JOURNAL" for May 7 (p. 368).—ED. J.G.L.

After the Kingsbridge holder had been designed, a contract was given to the builders by the Brooklyn Union Gas Company for a similar holder, which was erected at Newtown. With the exception of some minor details, this description applies equally to both holders.

The Tank Shell.

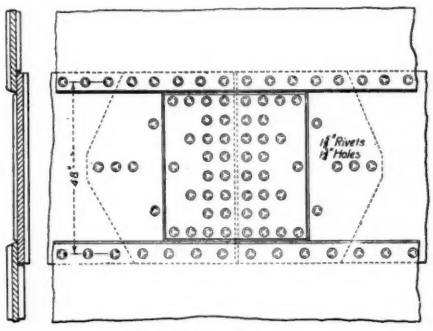
The tank shell is formed of nine rims or courses, the first or lowest of which is $2\frac{5}{16}$ in. thick and 4 feet in height. The uppermost course is formed of $\frac{1}{2}$ inch plates 6 ft. 1 in. high. The other rims are of intermediate thicknesses proportioned for a maximum unit fibre stress of 13,500 lbs. All plates are open-hearth steel of 55,000 to 65,000 lbs. ultimate strength. Test pieces were required to bend 180 degrees to a diameter equal to the thickness of the test piece without fracture on the outside of the bent portion.



Cellular Girder at Crown.

The vertical seams of the nine rims are spaced to come between the brackets attached to the tank shell for the support of the guide-frame. As this has 26 uprights or standards, there are likewise 26 brackets; and hence each rim of the tank shell is formed of 26 curved plates. All vertical seams connecting these plates are double butt joints arranged with some of the rivets acting in single shear and some in double shear, and so proportioned that the joint efficiency reaches 93 per cent. All horizontal seams are lap joints single-riveted with rivets varying in size from $1\frac{3}{4}$ inches for the first rim to 1 inch for the top rim.

A distinctive feature of steel gasholder tank construction is the care with which the plates are drilled and edged to ensure both the strength of the joints and the tightness of the tanks. The manner in which both the plates and the butt straps are bevel-edged is shown by the accompanying illustration of a typical joint. This work was executed with such accuracy that when the butt straps of a particular rim were stacked upon each other, the edges and drilling matched with a precision which suggested that the work had been performed at one operation. The largest of these butt straps were 8 ft. $3\frac{1}{2}$ in. long by 4 ft. $7\frac{3}{4}$ in. wide, were $1\frac{3}{4}$ inches thick, and weighed 2300 lbs. each.



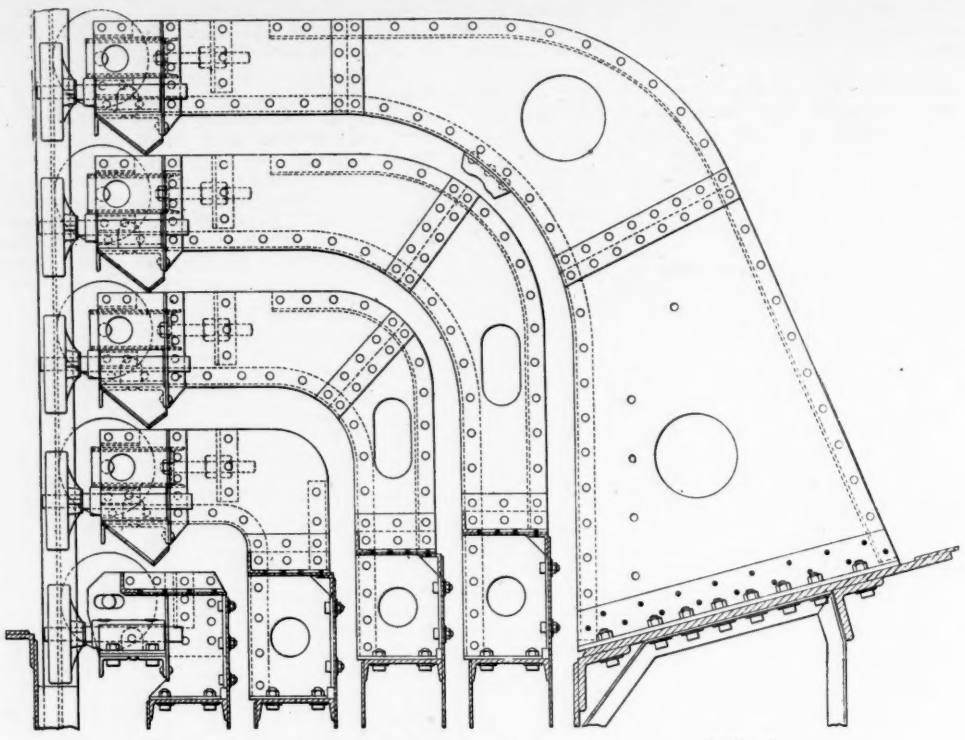
Typical Butt-Joint.

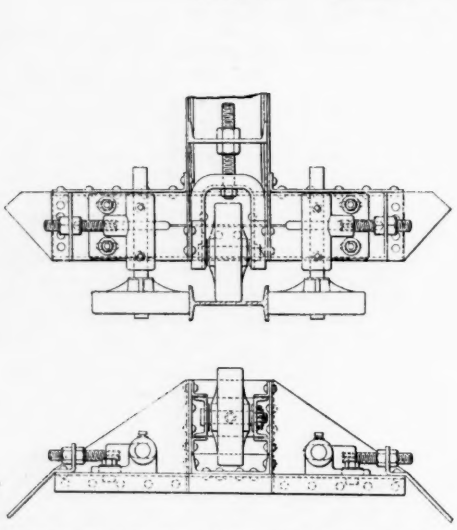
The tank bottom plate which rests directly on the foundations, with the exception of an outer annular course, is formed of $\frac{3}{8}$-inch steel plates, each of which is 7 ft. 6 in. wide and 20 feet long. They are connected by lap joints made up with $\frac{3}{8}$-inch rivets. The outer course to which the shell is attached is $\frac{3}{8}$ inch thick, and extends outwards beyond the lowest rim. The bottom curb attaching the tank bottom to the lowest rim is placed outside the tank, and consists of an 8 in. by 8 in. by $1\frac{1}{8}$ in. angle in 26 sections, joined by an angle connection-plate.

To maintain the circular form of the tank under the distorting action of the guide-frame, when resisting wind stresses, the upper rim is stiffened by a circular girder consisting of a horizontal plate $\frac{1}{2}$ inch thick and 4 feet wide. This plate is attached to the tank shell by a 5 in. by 5 in. by $\frac{1}{2}$ in. angle, and is stiffened round its outer edge by a 12-inch channel.

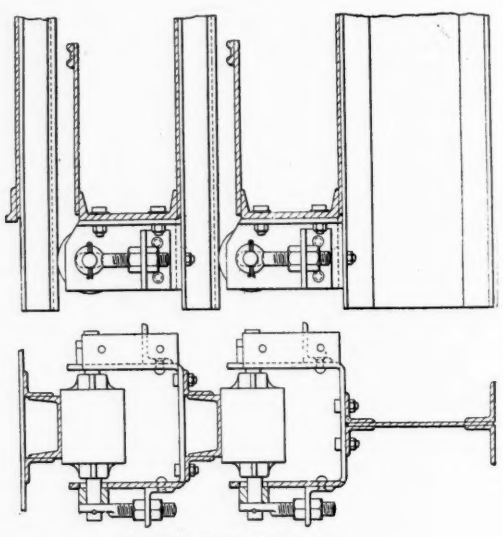
Brackets and Guide-Rails.

To accomplish the best distribution of the stresses imposed upon the tank shell by the guide-frame, the brackets supporting the standards are extended from the circular girder round the top





Plan and Front Elevation of Sections I., II., III., and IV.



Cup Roller and Bracket.

General Arrangement of Goose-Necks, Cup Rollers, and Guide Rollers.

of the tank down to the bottom curb. Each bracket is composed of a ½-inch steel web-plate with a front chord made of two 4 in. by 4 in. by ½ in. angles, and a back chord of two 6 in. by 3½ in. by 9-16ths in. angles. The web-plate of the brackets extends inward beyond the front chord angles a distance of 4 inches, permitting the attachment thereto of the angle clips by means of which the bracket is connected to all the nine rims composing the tank shell. The riveting of the angle clips to the shell is designed to avoid reducing the net section of the plate below that which is obtained at the vertical seams. Each bracket is attached to the circular girder by two 6 in. by 6 in. by ½ in. angles, double riveted both to the web-plate of the girder and the bottom flange of the standards. The guiding of the lower edge of the outer holder section is provided for by 52 guide-rails, formed of 8-inch steel channels spaced at equidistant points round the inner circumference of the tank shell.

Landing-Beams and Crown Support.

Experience has shown that in time there will accumulate upon the bottom of the tank a sediment of mud some inches in depth, and that tools and pipe fittings will be allowed to fall into the tank. To prevent buckling of the lifts by coming to rest upon an uneven support, 104 landing-beams formed of 12-inch I-beams are placed radially upon the tank bottom, with their outer ends adjacent to the shell. These beams are so placed round the circumference as to avoid the rollers and their brackets attached to the lower edges of the holder shells.

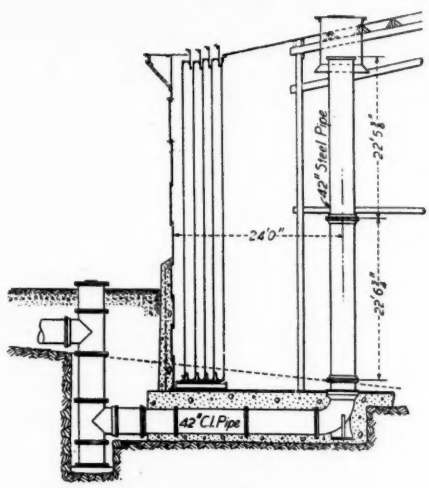
Standing concentrically within the tank is a composite steel and timber structure for the support of the crown of the first section when the holder is entirely deflated, and the crown is thus not expanded by the pressure of the gas. This crown support consists of six concentric rings of 8 in. by 8 in. wooden posts, with a steel centre column. The posts are connected by a series of radial rafters which support purlins formed to the curvature of the spherical crown. The lateral stability of the posts is secured by a system of radial and circumferential cross bracing.

Oil-Skimmer and Drainage.

Owing to the contact of the large volumes of gas passing through the holder with the water contained in the tank, oil is accumulated upon the surface. If this oil should be permitted to remain in the annular space between the inner section and the tank shell, the paint of the outside of the holder shells would become discoloured by contact with this oil when the shells are travelling downwards into the tank. The presence of this oil would also constitute the only liability to fire that could exist in connection with the gasholder. To permit the removal of the oil, the holder described is equipped with an oil-skimmer, patented by Mr. W. Cullen Morris, the Constructing Engineer of the Consolidated Gas Company.

This oil-skimmer consists of a circular dam sheet 30 inches deep, and attached to the outer ring of crown support posts. This dam is placed in such relation to the surface of the water that half its depth will be submerged. Attached to the outer surface of the dam is a semicircular trough, the lip of which is placed at such a height as to come just below the surface of the water. At four points of the circumference, 3-inch drain-pipes are carried

down from the trough to the bottom of the tank, thence along the bottom to the shell, whence they are taken up and out of the tank where they are attached to a steam-pump. Near the centre of the tank is a large funnel, the rim of which is likewise adjusted to come just below the surface of the water. This funnel is also connected to a 3-inch pipe which passes downwards and along the bottom of the tank, and then upwards to the pump. By means of this device, the oil may be drawn from the surface of the water outside the dam, and either returned to the tank within the dam or stored in some other reservoir.



Gas Connections to Tank.

Provision for drawing the water from the tank consists of a 12-inch cast-iron pipe which turns down and outward from the tank bottom, and connects with a local sewer. This pipe is closed by two heavy bronze-mounted gate valves in a pit outside the tank. As a precaution against losing the water through any break which might occur in the pipe inside the valves, a ball-valve is placed over the aperture of the draw-off pipe in the tank bottom. This ball valve is normally closed; but it can be opened from a manhole in the crown of the first section.

The gas connections of the holder consist of three 42-inch cast-iron pipes, which pass through the concrete foundation and turn upwards, connecting to the bottom of the tank. From this point a steel pipe of the same diameter extends upwards to a point above the highest possible water-line.

Inner Section.

The spherical crown of the inner section of the holder proper has a radius of 450 feet, which gives it a rise of about 16 feet in the centre. The compressive and distorting stresses which occur in the outer curb of the crown have already been described, and are resisted by a cellular girder, the design of which is shown by the accompanying illustration. The total compressive stress acting upon this girder amounts to 1000 tons.

The crown plates inside the heavy outer courses are all No. 8 U.S. standard gauge steel. There are 14 rows of side sheets of No. 10 steel, except the top course forming a portion of the cellular girder and the bottom course forming part of the cup, both of which are somewhat heavier. The rest of the hydraulic cup consists of a 10-inch channel placed horizontally, and forming a continuous ring riveted to the bottom shell course. Riveted to the outer flange of the channel, and extending upward, is the cup sheet 18 inches high. These two plates and channel, of which the cup is principally composed, are in 26 sections round the circumference; the ends being carefully faced, brought together by butt straps, and thoroughly caulked to ensure a water-tight joint.

The shell of the section is stiffened by 52 vertical legs, 26 of which are radially opposite the standards of the guide-frame; the others being intermediate. These legs are of a plate girder pattern; the web-plate being ⅜ inch thick and 18 inches wide, and the chord angles 3 in. by 3 in. by 7-16ths in. and 4 in. by 3 in. by 5-16ths inch. Attached to the crown of the holder, opposite the standards of the guide-frame, are the goose-necks, upon which are mounted the radial and tangential rollers which travel upon the guide-rail. These rollers, as well as the others employed in guiding the holder, are designed to permit an adjustment of several inches; but, in actual practice, very little of this possible movement is ever required for making such adjustments.

The spherical crown of the holder is occupied by a large volume of gas which is not available for distribution. As it may be necessary for workmen to enter the vertical inlet and outlet pipes which pass through the tank water, the loss of this unavailable gas is prevented by seal bonnets constructed in the crown of the section, and so located as to pass down over the tops of the vertical pipes when the section is landed. In such a case, if the gas were being drawn from the holder by pumping, and the exhausters were not stopped when the holder landed, there would be danger of the resulting vacuum causing the crown to collapse. This is prevented by designing the seal bonnets to give such a seal that the outlet-pipe would be flooded before collapse could occur. Manholes in the seal bonnets may then be removed, providing access to the pipes.

Attached to the under side of the hydraulic cup and to the lower end of the vertical legs are 52 brackets, upon which barrel rollers are mounted to travel upon the vertical legs provided within the next outer section. The outer sections are similar in construction to the inner sections, except in the absence of a crown and the presence of the grip constructed round the upper edge of the shells.

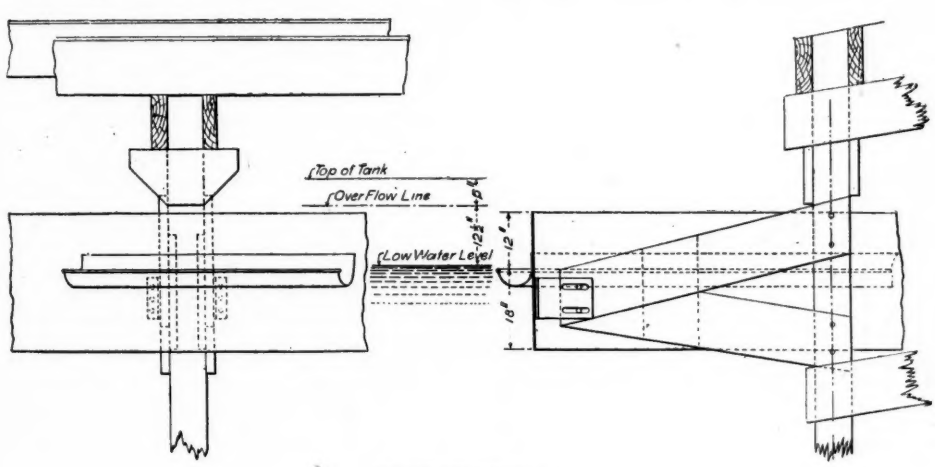
The Grips.

The grip resembles an inverted cup, though in this case the circumferential channel is riveted to the inside of the section. Attached to the inner flange of the channel is the dip-sheet, which extends 18 inches downwards, and a similar distance upwards. The purpose of this upward extension, called the dam, is to prevent the cup from overflowing under any circumstances possible with operating conditions, and also to permit the adjustment at its upper edge of a horizontal web-plate 16 inches wide. This web-plate is attached to the dam by 3 in. by 3 in. angles, and is stiffened round its outer edge by another angle ring of the same size. This web-plate is also bracketed to the dam sheet and the grip channel by radial ribs; the whole grip thus forming a circular girder to resist the distorting forces acting upon it, which have already been described.

Located at equidistant points round the inner circumference of each of the four outer sections are 52 vertical rails made of special 6-inch channels which have extra wide flanges. These channels are attached to the shells by 3 in. by 2½ in. angles; and, in addition to their function as guide-rails upon which the inner rollers travel, they also serve to stiffen the shells when the sections are resting upon the landing beams.

A hydraulic cup not being required for the outer section, it is stiffened round its lower edge by a curb formed of two continuous rings of 7 in. by 3½ by ⅝ in. angles, which are riveted to the shell of the section with ¾-inch rivets. Attached to this bottom curb are 52 steel brackets, upon which are mounted the cast-iron rollers that travel on the guide-rails provided on the inner circumference of the tank shell.

When fully inflated with gas, the holder will give the following approximate pressures at the tank coping: Section 1, 6·08 inches; section 2, 8·20 inches; section 3, 10·15 inches; section 4, 12·15 inches; section 5, 13·80 inches.



Oil-Skimming Device.

Preventing Ice.

To prevent the formation of ice during freezing weather, a heating device is provided for the four hydraulic cups and the exposed surface of the tank water. A 3-inch circular steam heater is carried round three-fourths of the circumference of the holder on brackets attached to the guide-frame standards. At four points of the circumference, risers are carried vertically upwards to the fifth tier of girders in the guide-frame. Each riser has four branches terminating with a brass swivel connection. These branches are so spaced that each will be located at the mid-point of the travel of one of the hydraulic cups. A metallic tube is attached to each swivel connection, from which it is suspended in a loop of such length as will permit the other end of the tube to follow the hydraulic cup to which it pertains throughout the entire vertical movement of the holder. It is thus necessary that the tubing shall be so suspended that it may be able to accommodate itself to the upward and downward travel of the section to which it is attached, and that it shall be so located that when driven by the wind it will not become entangled in either the gallery rails or any part of the guide-frame structure.

The tubing is attached through a swivel connection through a steam syphon, provided with two branches of 1-inch pipe which dip into the water in such a manner that water is drawn from a depth of several feet and returned to the surface. The syphons are so designed that in case a vacuum should be formed in the tubing through the condensation of steam, air will be admitted to prevent the water from being withdrawn from the hydraulic cups.

The Guide-Frame.

The guide-frame consists of 26 standards, each of which extends 224 feet above the top of the tank, and is divided into seven lengths. This subdivision permits the section composing the standards to be proportioned to the stresses in the seven corresponding panels of bracing. The web-plate of each standard is ½ inch thick at the bottom and ⅜ inch thick at the top. The front chord consists of two 4 in. by 4 in. by 9-16th in. angles, which are of less thickness for the upper sections of the standards. The back chord is formed of two 6 in. by 3½ in. by 9-16ths in. angles, also reduced in thickness for the upper sections. The guide-rail attached to the front chord consists of a 12-inch I-beam. The web-plate is stiffened by 6-inch channels spaced 5 feet apart.

The seven tiers of horizontal girders are formed of 15-inch channels in pairs, spaced 9 inches apart by diaphragms. The diagonals each consist of a single channel; those in the first panel being 10-inch and those in the seventh 6-inch. The twisting of the standards between the panel points is prevented by lateral members attached to both chords of each length of the guide-frame standards at the centre of the panels. These lateral members are riveted to the gusset-plate which joins the diagonals at their intersections; thus contributing materially to the stiffness of the diagonals.

To prevent the guide-frame from being distorted from its circular form when standing alone, the top row of girders are trussed in a horizontal plane to the tops of the standards. This bracing consists of ½-inch cap plates which extend over the top of the standards, beyond which they are supported by brackets. Extending from each end of these cap-plates to the third points of the girders are two 6 in. by 6 in. ½-inch angles, attached to the top flanges of the girders by ½-inch gusset-plates.

The Radial Traveller.

After the tank bottom of a holder has been assembled, all remaining parts of the structure are identified with the circular form. This fact is employed to the fullest advantage in the erection by the use of radial travellers. A steel post is located at the centre of the bottom, upon the top of which is mounted the trunnions of two radial trusses. The outer ends of these trusses are supported independently of each other on legs with wheels travelling on a circular rail laid on the tank bottom. Just beyond the perimeter of the tank, a circular track was laid upon the ground. This was used as a service track for transporting material from the range of a steel derrick to the point where it was required.

One of the radial arms was rigged for lifting the curved plates of the tank shell from the cars on the circular track and placing them in position, while the other radial arm was arranged for the suspension of a 16-ton hydraulic-pneumatic riveting-machine. The steam-pneumatic and hydraulic pipes leading to the riveter were brought up from the tank bottom at the centre-post, and carried through the hollow spindle of the trunnion about which the radial arms rotated. These pipes were thus carried along the radial arm and down the leg to the riveter.

Erecting the Tank Shell.

The tank shell was erected by lifting the plates and butt straps into position with one of the radial travellers, which was followed by the other travellers from which the riveting-machine was suspended. After the first two courses of the tank shell had been assembled and riveted, steel brackets were bolted to the sides of the plates through the holes provided for the adjustment of the standard supports; these brackets supporting planks forming a scaffold for the workmen. As each successive rim was added to the height of the shell, these brackets were moved upward. The radial traveller which was used for lifting the tank plates worked sufficiently in advance of the riveting-machine to permit the lowest shell courses of the five sections to be assembled on the tank bottom before the tank was completed.

As soon as the circular girder round the top of the tank was finished, it was used for supporting structural steel frames of a triangular form, which were about 15 feet high above the top of the tank. Attached to the vertical inner chord of these frames were brackets which supported a circular rail on which travelled 12 two-wheel trolleys. From each of these trolleys was suspended a pneumatic riveting-machine with a reach of about 4 feet, which drove the rivets in the holder shells. Simultaneously with this work already described, the crown support was erected upon the tank bottom, which permitted the assembling of the crown courses as soon as the holder shells had been completed.

In assembling the crown, the work proceeded from the centre outward. After the four outer sections had been riveted up to the grips, the bracketed circular rail and its supporting frame were removed. Special hoisting drums were then placed at equidistant points round the top of the tank for lifting the shells, one at a time, high enough to permit of the grips being riveted and caulked. This was necessary on account of the small clearance between the sections when landed.

Erecting the Guide-Frame.

To permit the completion of the crown, one of the radial travellers was entirely removed, and the outer leg of the other was cut down to such a length as would permit it running on a circular rail laid on the heavy outer crown course. This traveller was also provided with a centre-post, resting on the centre of the crown in its new position, and was used for erecting the lowest section of the guide-frame, which was first completed round the entire circumference. The tank having now been filled with water, air was pumped into the inner section, causing it to rise to a convenient height for erecting the next tier of guide-frame panels, using the radial traveller as before. The entire guide-frame was erected in this manner; the crown of the inner section providing a working platform which could be brought to any desired elevation by pumping in or letting out air in the way described. During the erection of the guide-frame, the holder shells were caulked wherever the seams showed any leakage under a soap-and-water test.

When the site has been graded, the soil will be banked against the tank shell to an average height of about 15 feet. To prevent the steel shell from being attacked by corrosion, it is protected by a reinforced concrete wall 24 inches thick at the bottom and tapered off to 18 inches at the top. To prevent the cracking of the concrete by the circumferential stretching of the tank shell under the hydrostatic pressure, the protection wall was not built until after the tank had been entirely filled. The tank contains 16 million gallons of water.

Upon the completion of the guide-frame, all the guide-rollers were adjusted. For this purpose, the holder was alternately inflated and emptied several times. The inner rollers were adjusted by workmen in row-boats floating on the tank water inside the holder.

Before painting was begun, the entire structure was thoroughly cleaned with wire brushes, after which a heavy coat of red lead was applied. This coat was well rubbed in, and after it had hardened the structure received two coats of grey paint.

Conditions were not so favourable to the rapid erection of this holder as they had been at Newtown, the holder at which place was completed entirely in seven months after the erection was begun. The 10 million holder recently completed at Manchester required three years and a half for its construction. The Kingsbridge holder was designed and constructed by the Bartlett Hayward Company, of Baltimore, under the supervision of the Engineering Department of the Consolidated Gas Company; Mr. W. H. Bradley being Chief Engineer, and Mr. W. Cullen Morris Constructing Engineer.

"Transactions" of the American Gas Institute.

It may be remembered that an announcement was recently made in the "Journal" that the proceedings at the last annual meeting of the American Gas Institute, held in St. Louis (Mo.), in October, were so heavy that it would be necessary to have two volumes to record them. This has been borne out by the arrival a few days ago of the volumes referred to. The first contains the report of the general business, the address of the President (Mr. Donald M'Donald, of Louisville), the papers submitted, Dr. Bone's lecture on "Surface Combustion," and notices of the life-work of deceased members. These matters occupy 610 pages. The second volume opens with diagrams and particulars of the Institute's standard pipes and specials, which are followed by the long series of "Wrinkles" contributed to the meeting by various members, and edited by Mr. A. F. Traver. Then comes the report of the Bureau of Information for 1911, consisting of answers to questions submitted to the Committee. The next section of the book is devoted mainly to the subject of photometry, and consists of reprints (by permission) of the reports of the proceedings of the International Committee contained in the "Transactions" of the Institution of Gas Engineers and in the "Journal." This is a noteworthy collection of papers, and will make the volume valuable for reference. Following these reports are the constitution and bye-laws of the Institute, the names of past officers of the merged Associations, and lists of the present members arranged first alphabetically and then geographically. The second volume consists of 590 pages. The technical matter is fully illustrated; and the books have as frontispieces portraits of the President and the Secretary (Mr. George G. Ramsdell).

LONDON AND SOUTHERN JUNIOR ASSOCIATION.

The Annual Meeting of the Association was held at the Westminster Technical Institute last Friday—the PRESIDENT (Mr. J. G. Clark) in the chair.

ELECTION OF OFFICERS.

The balance-sheet was adopted, and the following were elected as Officers and Council for the session 1913.

President.—Mr. D. J. Winslow (Lea Bridge Gas Company).
Senior Vice-President.—Mr. S. A. Carpenter (North Middlesex Gas Company).
Junior Vice-President.—Mr. J. Hewett (South Metropolitan Gas Company).
Council.—Messrs. W. E. Brown, T. F. Canning, S. B. Chandler, G. F. Cox, F. A. Frost, W. T. Hogg, G. H. Lloyd, and W. H. Vanner.
Hon. Secretary.—Mr. Ernest Scears (Hampton Court Gas Company).
Hon. Treasurer.—Mr. E. G. Stewart (Gaslight and Coke Company).
Hon. Auditor.—Mr. E. G. Merry (Gaslight and Coke Company).

THE WORK OF THE SESSION.—THE VALUE OF THE JUNIOR ASSOCIATION MOVEMENT.

The PRESIDENT, in dealing at some length with the work of the session and other matters, said that, with the conclusion of this evening's meeting, the Association would complete the ninth session of its history; and no better evidence of its utility could be required than the growth, from a small beginning, of its numbers and sphere of influence. There were now 152 members and seven honorary members on the roll—representing no less than 32 different undertakings. Since the last annual business meeting, the Association had been honoured by invitations to two special semi-convivial gatherings—the Shepherd's Bush Exhibition, at the invitation of the Gaslight and Coke Company, and the Festival of Empire Exhibition, at the invitation of the South Suburban Gas Company. They were honoured by Mr. F. W. Goodenough presiding at Shepherd's Bush, and Mr. Charles Hunt (supported by Mr. S. Y. Shoubridge) at the Festival of Empire Exhibition. Such support from their patrons was encouraging, and provided evidence that the work of the Junior Gas Association was appreciated by them. The opening meeting of the Association in October was particularly honoured by being presided over by their patron Mr. A. F. Browne. The inspiring address then delivered by him would not readily be forgotten, and formed a very valuable introduction to the Association's "Transactions" for the year. Mr. Browne was supported by Mr. Goodenough, Mr. J. W. Helps, and Mr. T. S. Lacey. Another very successful evening was provided by their patron Mr. W. R. Herring, who gave an interesting discourse on the importance of detail in engineering work. Mr. Herring was supported by Mr. F. J. Bywater, of the East Greenwich works of the South Metropolitan Gas Company. Several really valuable papers had also been contributed by members of the Association. There could be no doubt whatever that the future and continued progress of the gas industry would depend almost entirely on there being an abundance of trained men. The industry was as sound as an industry could be from an economic standpoint. Its resources and possibilities were so vast, and its applications so far-reaching, that it must be amusing to anyone of them to hear the predictions from certain quarters as to the last days of gas. This day would probably arrive when the supply of gas-making material ceased. They were all aware of the statements that came to them from time to time from the highest quarters of the gas industry, to the effect that its position was never stronger than at present. Besides providing a valuable commodity for the community, it helped to conserve the coal resources, and to minimize that blot on civilization the smoke evil; and for these reasons it could be regarded as of great national importance. The point he wished to emphasize was the value of the Junior Gas Associations as a means of education in matters appertaining to the industry—consisting, as they did, of representatives of every department of a gas-manufacturing organization. He was ready to admit the great advantage the Association had been to him. The experience of their colleagues was freely given to them, and many hours of work must have been avoided by the timely advice of one to another. In addition to the meetings, they had been privileged to visit various works during the session; and it was difficult to over-rate the educational value of these visits. A special event was the visit of the Midland Junior Gas Association to London in November. The Council met them, and provided a programme including an inspection of the subways in the city and a tour of the cities of London and Westminster to view the street lighting. As the representative of the Association, it had been his pleasure to attend the meetings of the Senior Association; and he had always met with words of appreciation of the work of the Juniors. He would like to place on record the kindness of Mr. Bywater in consenting to be elected an hon. patron of the Association. They had suffered a loss during the session in the death of their patron the late Mr. Harold Iago, of the Shoreditch and St. Pancras works of the Gaslight and Coke Company. Finally, he wished to fully acknowledge the honour done him in electing him President for the past year, and the hearty co-operation he had received from the Council and the members. In retiring from the chair, he did not retire from the Association, but sincerely hoped that it would be his privilege to identify himself with the Juniors for many years.

ALTERATION OF RULES.

Mr. W. J. LIBERTY, moving the following alteration of the rules, said the matter had been carefully considered by the Council; the object being to open up the way in future for the introduction of "new blood" upon the Council, and to prevent the Council becoming a body of "Past-Presidents." As it was the Past-Presidents who were moving this addition and alteration, and it was therefore in the nature of a self-denying ordinance, they trusted the proposal would be unanimously passed.

> The business of the Association shall be conducted by a Council consisting of a President, two Vice-Presidents, Honorary Secretary, Treasurer, Auditor, and eight other members, all of whom shall hold office for one year commencing from the annual general business meeting in May of each year. Unless the Council determine otherwise, the President shall retire and become an ex-officio member of the Council for two years, *at the expiration of which period he shall be ineligible for re election to the Council for two years.* The ordinary members of the Council shall be eligible for *re-election for not more than five consecutive years, unless appointed to the office of Honorary Secretary, Treasurer, or Vice-President.* The retiring President shall be succeeded by the Senior Vice-President, and the Senior Vice-President by the Junior Vice-President, leaving a new Junior Vice-President to be elected.
>
> Honorary members shall be eligible to take part in the reading of papers, discussions, &c.; but shall not hold office or take part in the voting at business meetings.
>
> Should a member cease to possess the above qualification, he shall no longer be a member of the Association, and shall forward his resignation to the Hon. Secretary.
>
> [The rule as altered is underlined. The last clause follows on at the end of the existing rule *re* qualification.]

The motion was carried unanimously.

Mr. L. F. TOOTH proposed—"That this annual general meeting of the London and Southern District Junior Gas Association desires to place on record, upon his relinquishing the office of President, its appreciation of Mr. J. G. Clark's untiring energy in conducting the affairs of the Association during the past year, but more especially his zeal in the promotion of the educational and scientific subjects connected with the industry, which have proved so beneficial to, and highly appreciated by, its members;" and that the resolution be suitably emblazoned, signed by the officers, framed, and presented to Mr. Clark.

Mr. LIBERTY, in seconding, said Mr. Clark was a technician of a very high order, and had brought rare qualities to bear upon his office. They had had various types of Presidents in the past, connected with different branches of the industry; but Mr. Clark would always be known as the "Technical President."

The resolution was carried, and Mr. CLARK suitably responded.

Votes of thanks were also accorded to Mr. Ernest Scears (the Hon. Secretary), Mr. J. Hewett (the Hon. Treasurer), and Mr. E. G. Merry (the Hon. Auditor).

Sales of Stocks and Shares.

The outstanding feature of the sale conducted by Messrs. A. & W. Richards at the Mart, Tokenhouse Yard, E.C., last Tuesday was the placing of three new issues of capital by order of Directors. The Harrow and Stanmore Gas Company had for disposal 600 "C" shares (£10), ranking for a maximum dividend of 7 per cent., subject to the sliding-scale, and carrying £7 14s. per cent. as from the 1st of July; and they were all sold at £15 to £16 each. The Lowestoft Water and Gas Company offered 400 ordinary £10 shares (7 per cent.) and £1000 of 4 per cent. perpetual debenture stock. The shares fetched £10 5s. to £10 10s. each. They will carry dividend at the rate of 5¼ per cent. per annum from the date of payment. The debenture stock was all sold at from £101 to £102 per £100. A new issue by the Bognor Gas Company consisted of £3000 of additional consolidated ordinary "A" stock, and £2000 of 4½ per cent. perpetual debenture stock. The standard dividend on the "A" stock is 5 per cent.; but 5¼ per cent. is being paid upon it. The new issue was all disposed of at £105 to £107 per £100; and the debenture stock at par. On the same occasion, Messrs. Richards sold for Trustees and other owners some £10 "A" shares (8 per cent. but carrying 4½ per cent.) in the Tendring Hundred Water Company, at £11 12s. 6d. each; and a few "B" shares, of similar nominal and dividend-bearing value at £11 a piece. Some £10 original shares in the Mid-Kent Water Company (maximum dividend 10 per cent., but carrying 6½ per cent.) fetched £14 5s. to £14 17s. 6d. each. The final lots consisted of £600 of ordinary "C" stock of the Ilford Gas Company, ranking for a standard dividend of 5 per cent., but paying 7½ per cent., though the present selling price of gas entitles the stockholders to £7 12s. 6d. per cent. per annum for the current half year. The stock sold at £161 to £161 5s. per £100.

Value of Cookery Classes.—In the course of the remarks made by Mrs. Smyth-Pigott when opening the gas exhibition at Weston-super-Mare, to which reference is made elsewhere, she laid stress upon the value of gas-stoves for culinary purposes and of the knowledge of cookery which could be acquired at the classes now so common. She said she would give one word of advice to the mothers of Weston, and that was to follow her example by teaching their daughters how to cook, or to send them to cooking classes and have them taught the art scientifically from the beginning. One of her girls, who was now married, had started with the cleaning of pots and pans, and the scrubbing of a kitchen table until it wore the appearance that only silver sand and elbow grease could give it, and had then gone on to the preparation of various dishes; and generally she had found what she had learnt at cookery classes to be an immense help to her.

REGISTER OF PATENTS.

Automatically Operating Gas-Valves.

"NOVITAS" FABRIK ELEKTRISCHER APPARATE ACTIEN-GESELLSCHAFT, of Zürich, Switzerland.

No. 24,034; Oct. 30, 1911. Date claimed under International Convention, Oct. 29, 1910.

This invention relates to apparatus which performs work of comparatively short duration at predetermined times—"work requiring more power than the mean available power of the motor supplying power to the apparatus, so that the power given out by the latter is added together in the interval between two performances of work and is consumed at the predetermined time." In particular, the invention has for its object the lighting and extinguishing of gas or electric lamps at predetermined times by means of an auxiliary spring influenced by the main spring of a clockwork arrangement.

In known apparatus of this class, the patentees mention that toothed sliding pieces are fixed on the hour disc, and serve to rotate a toothed wheel loose on an extended spindle of the cock plug, whereby a spring connected to the latter is tensioned; this spring becoming untensioned when a toothed sliding-piece comes out of engagement with the toothed wheel and thus rotates the cock plug.

In contradistinction to this arrangement, according to the present invention, there is fitted on the hour-shaft of the clockwork an axially movable auxiliary spring-box, the spiral spring of which is connected to the hour-shaft and is tensioned by the intermittent impact of a projection on the spring-box against pin-stops. The axial movement of the auxiliary spring-box causes the projection to slip off each pin on which it bears, and thus produce an untensioning of the spring.

The movement of the auxiliary spring-box is produced by a lever which revolves with the hour-shaft and whose arms are moved in one or the other direction by set pins, so as to rotate an eccentric engaging in a groove in the auxiliary spring-box. The movement of the auxiliary spring-box in one or the other direction, of course,is used to effect the opening or closing of a gas-valve or cock, or the making or breaking of an electric current circuit.

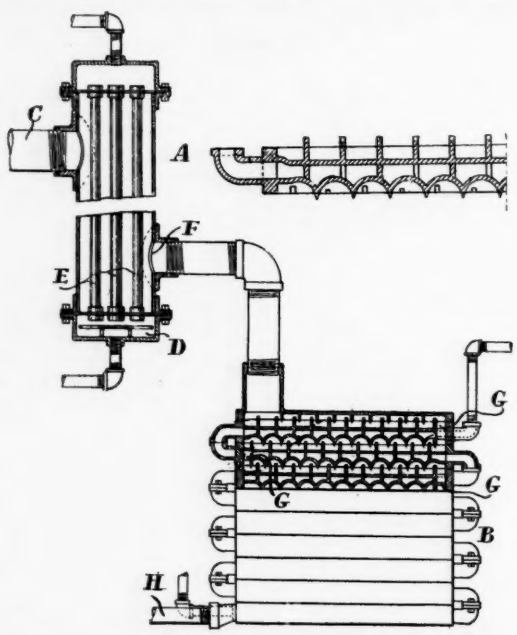
Ammonia Concentrators.

WRIGHT, W. H., of St. Paul, Minnesota, U.S.A.

No. 10,053; April 25, 1911. Date claimed under International Convention, May 2, 1910.

This invention relates to concentrators used in connection with ammonia distilling apparatus, for the purpose of producing "a highly concentrated ammonia liquor in an apparatus which is economical in first cost and in cost of operation."

The absorber, which is combined with a suitable condenser, comprises a series of floors having passages for the condensate, passages for cooling fluid in proximity to the passages, and baffles whereby the vapours accompanying the condensate are caused to pass through the latter successively from channel to channel throughout the length of each floor in turn, and to become absorbed.



Wright's Ammonia Concentrator.

In the illustration, A is an ordinary water-cooled condenser connected to the water-cooled absorber B of special construction. In the condenser, the ammonia vapours from ammonia-distilling apparatus are received through the pipe C. Cool water is admitted to the chamber D, where it is distributed by a baffle-plate and passes upward through the tubes E. The hot vapours passing downward about the tubes are cooled and condensed, and pass out through the opening F, whence they are led to the hood of the absorber B.

This is made up of a series of rectangular segments one above the other, having connected passages between them for the flow of the condensate, and connected passages within them for the flow of water through the absorber. In the passage-ways for the flow of the condensate, the upper floor of the intermediate and bottom segments is divided, by a series of dams having weirs at alternate ends, into a corresponding number of narrow canals. By this arrangement the liquors entering at one side of a given segment, or condensing from the vapours in transit over the segment, are forced to flow back and forth, from one end of each canal to the other, till the opposite side of the segment is reached, where it flows over the last weir down through a passage G into the first canal of the next lower segment. This course is followed through the various segments till the bottom of the absorber is reached, whence the liquor flows out through a pipe H. During its travel, the liquor is constantly cooled by water flowing through the passages in the interior of the segments, which correspond approximately in number and location with the liquor canals. The partitions which form these compartments within the segment are open at alternate ends, and the cooling medium enters the passages in the bottom segment and follows them back and forth, upward from segment to segment, in the opposite direction to the constantly descending ammonia liquor. In this way, the liquor is brought in contact gradually and successively with colder and colder surfaces.

Depending from the lower surface of each segment are partitions or baffle-walls (with serrated edges) parallel with the other walls of the absorber and extending down into the canals between these walls and dams so as to form in the liquor in the canals a seal for the gases lying above the liquors. The depth of the seal is determined by the depth of the baffles and the height of the weirs in the dams. As the seals extend entirely across the segments forming a series of separate parallel compartments, the gases and vapours which accompany the condensate from the condenser pass through the absorber only by breaking through the seal and passing under the baffle-walls from compartment to compartment of each segment and through the passage G to the segment below where the process is repeated.

Analyzing Gases.

SANDERS, L., of New York, and SANDERS, REHDERS, and CO., LTD., of Fenchurch Street, London, E.C.

No. 1683; Jan. 23, 1911.

This apparatus is for analyzing gases to determine their composition quantitatively with respect to one or more constituents—for example, sulphur dioxide, oxygen, carbon dioxide, and other gaseous compounds and elements. The invention has more especial reference to apparatus of this character wherein a constituent (as, for instance, carbon dioxide) of a measured quantity of the gases is absorbed by some substance for which it has an affinity; the remaining gases being again measured in a recording vessel so as to indicate the amount of the constituent absorbed.

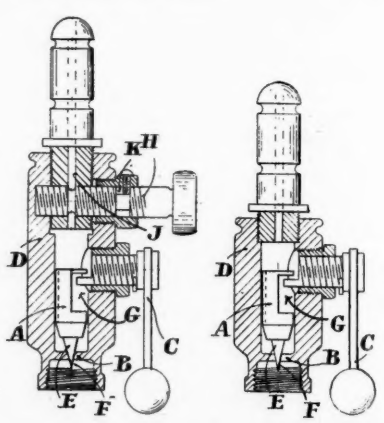
The invention has for its chief object to provide improved apparatus for the purpose—being especially directed to the "obtaining of greater accuracy and to less sensitiveness to disturbing influences both internal and external." The apparatus is more particularly designed for the determination of the carbon dioxide content of furnace gases, but is capable, with modifications, of use for the analysis of other gaseous mixtures.

Automatic Safety Gas Cock and Valve.

JEFFERY, S. F., of Southend-on-Sea.

No. 10,518; May 1, 1911.

This automatic combined gas cock and valve provides a safety device for automatic gas-meters, whereby, when the valve is opened by hand, it is maintained open by the pressure, until the pressure is reduced, when it drops into its hole or seating, and so prevents any escape at the burners when the coin is renewed.



Jeffery's Automatic Safety Cock and Valve.

The valve (as shown) consists of a cylindrical float, having on its bottom end a pin E with its extending shank or tail F, which protrudes beyond the orifice of the valve-chamber D for closing the outlet to the burner. For lifting the pin-valve direct up out of its seating, there is a weight-controlled crank-lever C, which (when raised) engages in the elongated slot in the cylindrical float A, raising it direct up, and giving the gas, through the valve E, its initial start.

In operation, the valve A, being raised, allows the gas to flow through the pin hole or seating B on to the main body of the valve, thereby floating it. The pressure of the gas will not lift the valve, owing to

the small lifting surface of the shank or pin end E of the valve. But on being raised by the lever, it allows the gas to flow through the seating B on to the main body of the lifting surface of the valve, thereby floating it and allowing the gas to be consumed through the burner. Should the coin be spent out, or the main cock turned off, the pin-valve would drop into its seating, and cannot be opened by the pressure of gas when the coin is renewed or the main cock turned on, except by raising the valve by the lever, when the gas floats the valve and allows the gas to be consumed.

When raised, the crank-pin engages in the elongated slot G in the float, and serves to effect the initial raising of the pin up out of its seating, thereby allowing the gas to flow past the float and maintain it in its open position until the pressure is reduced, when it drops into its seating and seals the orifice. This prevents any escape of gas when the supply is renewed, whether the taps be left on inadvertently or otherwise. H is the screwed plug of the cock or regulator; and J is the gas-channel. By unscrewing the plug back to the stop K it turns off the gas, or regulates it as desired.

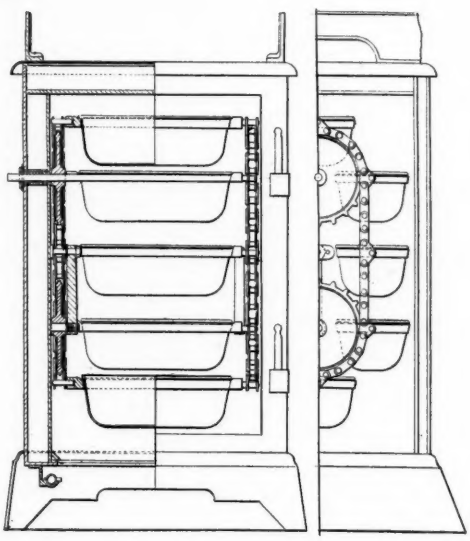
Gas Cooking-Ovens.

ROGERS, R. A., of Shanklin, Isle of Wight.

No. 9513; April 19, 1911.

This invention has for its object the prevention of substances from burning while being cooked in gas-ovens.

Devices have heretofore been proposed in this connection, says the patentee, for use in large brick or other built-up ovens in which the substance to be baked has been caused to move its position during the operation of cooking, with the object of avoiding the burning of the substance owing to an uneven application of heat. Such ovens have usually comprised a chamber of brick, heated externally and containing in the interior horizontally disposed travelling bands, belts, or chains carrying removable cradles, which are slung upon, or supported by, horizontally disposed bars connecting the bands or belts on which are placed plates or trays for the reception of the substance to be baked.



Rogers' Gas Cooking-Oven.

The object of the present invention is to enable the ordinary domestic ovens of gas-stoves which are heated internally to employ a device somewhat on the same principle, by providing them with a series of pivoted open frames or cradles (as shown) removably mounted between, and supported at each end by, two chains adapted for being rotated by sprocket wheels driven by any suitable motive power "whereby the heat, which is supplied from within the oven, is applied more evenly and a more constant temperature obtained in the oven without opening the oven door."

Continuous Distillation of Coal Tar.

HIRD, H. P., of Norwood Green, near Halifax.

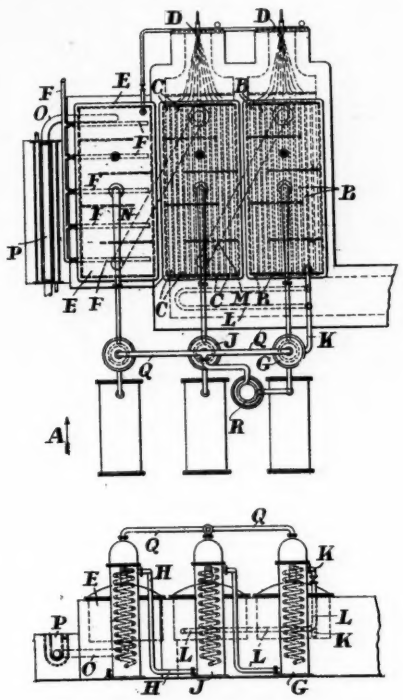
No. 11,143; May 9, 1911.

This invention relates to the arrangement of plant for the distillation of coal tar continuously "in different and successive fractions," while the residual pitch is continuously discharged at the same time. The inventor (as is customary) employs a plurality of horizontal stills working in series with means for condensing and collecting separately the products of distillation of the various stills.

The illustration shows a plan of a three-still installation, and an elevation of part of the plant looking in the direction of the arrow A.

Each still consists of a rectangular tank with flat bottom and flat sides and ends; the top of the still being either flat or (as shown) slightly domed. The two right-hand stills are provided near the bottom with tubes B and C extending longitudinally through the end walls, and adapted to conduct heat produced by burning, in burners D, creosote from the still E. The products of combustion, after passing through the series of tubes B C, are led away by a flue F. "This method of heating by tubes gives a greater heating effect with less consumption of fuel than is obtained by the usual furnace heating, and causes a brisker circulation of the liquid in the stills."

The whole of the stills in the plant may be heated in the manner described; but preferably the last still in the series is heated by steam-pipes G supplied with steam which passes through lateral perforations in the pipes into the liquid. Each still is provided with a series of vertical baffle-plates, in order that the tar may be forced to take a zig-zag path through the still, and thus "allow it to be in intimate contact with the whole of the surfaces of the heating tubes for as long a time as possible, with any given rate of flow." The depth of tar in the stills is proportioned to the depth of the stills; but, "generally speaking, would not exceed (say) 15 inches—this giving a thin layer of tar, which facilitates the process of distillation."



Hird's Tar-Distillation Plant.

Each still is provided with a separate outlet pipe for the products of distillation, leading to the upper ends of worms located in condensing chambers, with their lower ends connected to chambers in which the fractional distillates are collected.

Assuming the plant to be charged and at work, the tar is fed in at the lower end of the condensing chamber, and rises up in it—becoming heated by contact with the surface of the worm—and passes out of the chamber at the top end. The pipe H then conveys the tar to the chamber I, and after passing up through this chamber it is conveyed to the chamber J, through which it also rises—being thence conducted by the pipe K to the first still, either directly or by way of the bye-pass pipe L. The tar then flows through the first still in a zig-zag path, and is conducted through the pipe M to the second still, and thence, by the pipe N, to the third still, whence the residuals are conducted, by the pipe O, to the cooling receptacle P. The tar, as it passes along, is gradually heated; the vapours given off being collected by the pipe Q, condensed in the worm R, and conveyed in this instance into the first collecting chamber—though preferably the distillate condensed in the worm, and representing the first fraction, would be separately collected. The vapours given off in the respective stills are separately condensed in different worms, and collected in separate chambers or receptacles—the distillates obtained from each succeeeding still representing a higher fraction than that from the preceding still.

It will be observed that the incoming tar is made use of to effect the condensation of the respective fractional distillates, with the exception that in the arrangement shown it is not led through the condensing chamber of the worm R, which is preferably water cooled, though the tar may, if preferred, be led through this condensing chamber also, placed as it is in any desired position with relation to the other condensing chambers.

Gas Controllers and Timing Devices.

HORSTMANN, G. O. H. & E. H., and EDGAR, W. T., of Bath.

No. 14,825; June 26, 1911.

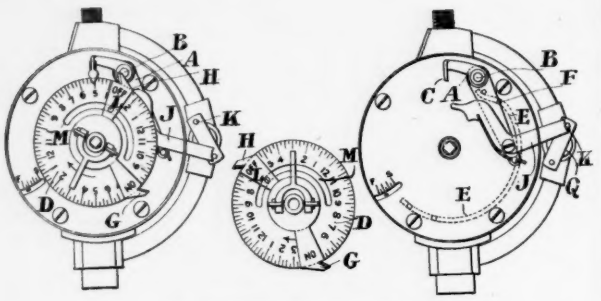
The objects of this invention are to provide means to effect the alternatively opposite angular movements of the plug of a gas-cock (whereby the gas is turned on and off) in an instantaneous manner by the discharge to its normal position of a spring or gravity-actuated discharge and power lever operating in identical or parallel planes to the dial plate in which power is both stored and discharged at each operation by either of two tappets ("discriminating tappets") of equal radii; the storage of power in the lever by its angular displacement and its discharge being effected by one and the same tappet—one tappet always turning the gas on and the other tappet always turning it off.

The patentees illustrate their invention by its application to a gas-controller of the type described in patent No. 23,161 of 1909.

The illustration on next page shows two positions in which the movable element operates the gas-cock (one with the dial-plate removed), and a front view of the dial-plate detached.

They pivotally mount on a stud B, carried by the top plate of the

controller, a power lever A, whose engaging nose C is so placed that, when tappet arms carried by the dial-plate D in their daily rotation come into contact with it, they raise the nose, thus giving an angular displacement of the power lever, which, being spring-actuated, by a long flexible spring C arranged under the top plate (shown in dotted lines), returns to its original position and rests against a pin F on the top plate, as soon as the nose has discharged from the inclined planes G or H of the tappets.



Horstmann's Gas-Controller.

Pivotally mounted on the power lever is the movable element J, in the form of a lever, so shaped, and so spring or gravity actuated, that one of its arms normally abuts against the pin K of the plug of the gas-cock while the other arm is placed in position to be guided by the pin L of the "off" tappet, so that the engaging arm abuts against the opposite pin of the plug whenever the "off" tappet is in operation. It will thus be seen that when the inclined plane of the "on" tappet has raised the nose of the power lever and discharged it, the arm of the movable element J, acting in its normal direction, abuts against the pin K of the plug and turns the gas on. When, however, the "off" tappet, which is provided with a pin or stud L (protruding through a slot M in the dial-plate), is in operation, the arm of the movable element J is guided by its arm resting against the pin or stud L into another direction, so that, when discharged, it abuts against the pin of the plug and turns the gas off. It therefore follows that the direction of the point of contact in relation to the power lever will depend upon whether the arm of the movable element J is diverted during its discharge by a projection from the tappet in operation. It will also be seen that, by varying the position of the pin or projection L in the tappet arm, the point of contact can be diverted in a direction suitable for the operation of the plug of the gas-cock to a third position—viz., between the points of extreme "on" and "off," as is sometimes required for use in conjunction with a gas-cock in which at its extreme angular positions several burners are respectively lighted and extinguished, but at a position between these extreme points where one or more of the burners are extinguished and one or more are left burning. In this instance, of course, three tappets would be required—two provided with projections at suitable points.

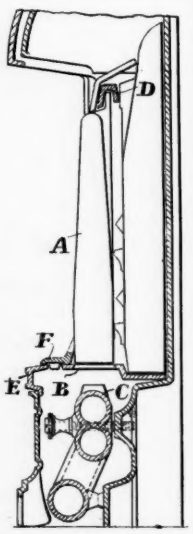
Gas Heating-Stoves.

DAVIS, H. N., and TWIGG, W. R., of Luton.

No. 15,381; July 1, 1911.

This invention relates to the securing of "fuel" in gas-stoves—the fuel consisting of a series of upright columns provided at their upper ends with projections intended to be held in an inverted channel or groove. The columns, supported on the base-plate under which are the burners, are pressed against the fire-brick back of the stove by a bar supported on the front facing, and held in place by a tongue on its lower side, taking into a recess in the front facing.

The fuel columns A are supported upon the perforated base-plate B, below which the burner C is arranged; while the tops of the columns have projections held in the inverted channel or groove D. Between the base-plate B and the front E of the stove a groove or slot is left, in which a tongued bar F is laid, and held by the tongue in the groove so as to secure the fuel columns in place at their lower ends.



Davis and Twigg's Gas Heating-Stoves.

Rotary Gas Scrubbers and Washers.

CHANDLER, S., of Balham, and WALLER, B. B., of Stroud, Glos.

No. 18,562; Aug. 17, 1911.

The object of this invention is said to be "to do away with the large number of 'distance-pieces,' probably numbering some 15,000 in a large machine, and which have holes in them for bolts to pass through," as shown in patent No. 2832 of 1899. With this end in view, the applicants have devised a "distance-piece" to keep the boards apart, consisting simply of a cork or wood-headed nail or stud of a thickness to suit the desired and determined space for the gas-way between the boards. The sharp metal nail end is of sufficient length to be driven into and through each board and clenched to the board by the end.

APPLICATIONS FOR LETTERS PATENT.

11,288.—DIAMOND, W., "Manufacture of sulphate of ammonia." May 13.
11,294.—BRUCE., A., AND Co., and BRUCE, A., "Air-gas plant." May 13.
11,501.—WIELAND, S. A., "Gas-cooking apparatus." May 14.
11,507.—LIDDALL, J., "Gas-rings." May 15.
11,564.—BIHELLER, S., "Bunsen burners." May 15.
11,591.—RUSTIGE, F. J. H., "Regulating gas." May 15.
11,608.—KENT, W. G., "Controlling water in mains." May 15.
11,611.—MITCHELL, E. A., "Pressure-controlling systems." May 15.
11,641.—TERRY, G., "Swan-neck burners." May 16.
11,654.—MITCHELITE PETROL AIR-GAS SYSTEM COMPANY, LTD., and HARSANT, H., "Apparatus for manufacturing petrol gas." May 16.
11,664.—SIMMANCE, J. F., ABADY, J., and WOOD, F., "Gas-analysis apparatus." May 16.
11,679—HÜFNER, O., "Analyzing gases." May 16.
11,700.—ANDRIVEAU, M. A. G., "Cocks and valves." May 16.
11,717.—GUMZ, L., "Moving the lower doors or lids of vertical retorts or chambers." May 16.
11,718.—KENT, W. G., HODGSON, J. L., and GREY, F., "Measuring the density of gases." May 16.
11,777.—SOUTH METROPOLITAN GAS COMPANY, and CHANDLER, D., "Gas-fires." May 17.
11,794.—COLEMAN, E. W., "Mixing gas and air." May 17.
11,818.—KENT-JOHNSTON, A. G., "Lighting and extinguishing gas-lamps." May 18.
11,830.—FURSE, A. D., "Manufacture of gas from waste products." May 18.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF COMMONS.

The following further progress was made with Bills down to the rising of the House last Wednesday for the Whitsuntide recess:

Bill read a second time and committed: Ystradfellte Water Bill [Lords].

Bills read the third time and passed: Gas and Water Provisional Orders Bill, Scunthorpe Urban District Water Bill, Shipley Urban District Council Bill.

The second reading of the South Suburban Gas Bill [Lords], which stood for Monday last week, has been deferred till the 7th prox. Petitions against the Bill have been presented by the London County Council, the Bromley Corporation, and the Metropolitan Water Board.

A Bill "to enable local authorities to contribute towards the expenses of legal proceedings and Private and other Bills involving questions of common interest," has been presented by Sir Ryland Adkins, and ordered for second reading on the 5th prox.

Progress of Meters Limited.

When moving the adoption of the report of this Company, as noticed in the "JOURNAL" for the 14th inst. (p. 467), at the annual meeting in Manchester last Tuesday, the Chairman (Alderman Miles) mentioned that Messrs. J. & J. Braddock, of Oldham, one of the constituent firms of Meters Limited, attained their jubilee in December last, and were able to record for the year a greater number of transactions than in any previous twelve months of their existence. As to the general prospects of the combination, they were exceedingly satisfactory. They were placing £10,000 to the reserve fund, which would bring it up to £85,000; and land, buildings, and machinery stood at £423,324, to which £23,867 was being added—making £447,191. Against this they had written off £54,505; so that they now stood in a better position by £30,000 than when they began business. In one branch—that of Messrs. George Orme and Co.—there was being manufactured an article connected with the textile industry which was proving an important addition. Then they were adding to their patents and the improvement of them every year. Mr. G. H. Braddock, in seconding the motion, stated that though the record output had been chiefly due to the large increase in the foreign trade, the home trade also had developed satisfactorily.

Haverhill Gas-Works Results.

In proposing the adoption by the Haverhill Urban District Council of the Gas Committee's report and accounts for the year to March 31, Mr. J. B. Coster said that, so far as the year's trading was concerned, they could congratulate the ratepayers, as owners of the concern, that it had been a successful period. The income was a little less than for the previous year—being £2700, against £2900; and this was due, in the first place, to the reduction of the price last year, and, in the second, to the fact that during the last month of the period the coal strike was in progress, and they had to economize in every way, so that nothing like the average quantity of gas was consumed. The residuals brought in £930, against £970; while for fittings they had received slightly more. Coal had been pretty much the same; and, generally speaking, the expenditure of the year worked out at a normal figure. The profit came to £835. Out of this they had dealt with £391 in the repayment of loans, which brought their capital indebtedness down to £2600. Another portion of the profit had been expended on the works and fittings. Then there was the question of the future. They had learnt a lesson from the coal strike; and the Committee thought it would be wise if in future they held a slightly larger stock of coal. They found that, by filling in the third arch of their regenerative beds, as a stand-by if required, they might do away with the old plant, and thus make room for storage of coal. In reply to a question, Mr. Coster remarked that, though £835 was the actual profit as a trading concern, the balance available was a little under £300. The report was passed.

CORRESPONDENCE.

[*We are not responsible for opinions expressed by Correspondents.*]

Early Days of the British Association of Gas Managers.

SIR,—Mr. Newbigging, in his letter of the 16th inst., has given me proof that my memory is not the reliable authority that I conceived it to be. It comes to me as a complete surprise to find that Mr. J. G. Barlow was not elected first President of the Association, though, without question, he occupied the chair at the preliminary meeting which I attended at the Royal Hotel, Manchester. This meeting, I now conjecture, must have antedated by several weeks that which Mr. Newbigging refers to, and at which the Association was established by resolution.

I have not suggested that I was present on the latter occasion, or at the first general meeting, but only at a meeting at the Royal Hotel, which was adjourned for a week.

It is amusing to recall that, on my second visit to the Royal, in response to my inquiry as to a meeting of gas managers, I was conducted to a room in which about twenty men sat round a long table, at which I confidently took possession of a vacant chair. But there was not a soul that I could recognize! Something was being read about gas; and this I soon discerned was a mere report. I then said to the gentleman who sat next to me, "This is not a meeting of gas managers, is it?" and to this he replied, "Well, in a sense it is, for we are the Corporation Gas Committee."

I think I have now said enough to prove that I took a fairly active part in the promotion of the Association.

HENRY WOODALL.

Llandudno, May 23, 1912.

The Chemical Clause.

SIR,—You are undoubtedly performing a service to the gas industry in giving prominence to the recent action of Parliament in regard to this matter.

It seems to me that, without desiring to do any injustice, the various Committees are tying the hands of gas undertakings, because in the past it has not been a general practice for one works to buy raw residuals from another, and because the need for freedom in this respect has now been proved to be important, if not vital, in view of future developments.

A quite recent demand has sprung up for prepared tar for the surfacing of roads; and, in order to meet this, a number of undertakings have provided plant for de-hydrating their tar. But if the Road Board specifications are to be strictly complied with, many works will have to buy crude tar from their neighbours, so that, by blending it with their own product, the necessary proportions of the different constituents may be obtained.

Cases may be easily imagined where a number of works may be so placed that their tar, if sold to the nearest tar distiller, yields but a poor return, while if they combined to produce an acceptable article to road surveyors they would sell the bulk of it locally, at a price which would enable them to sell cheaper gas, and at the same time allow dustless roads to be made at a minimum cost. Surely this would be more to the interest of the Government and the public than for the value of this residual to be nearly all swallowed up in railway carriage.

W. W. TOWNSEND.

Hereford, May 24, 1912.

The Ilkeston Gasholder Disaster.

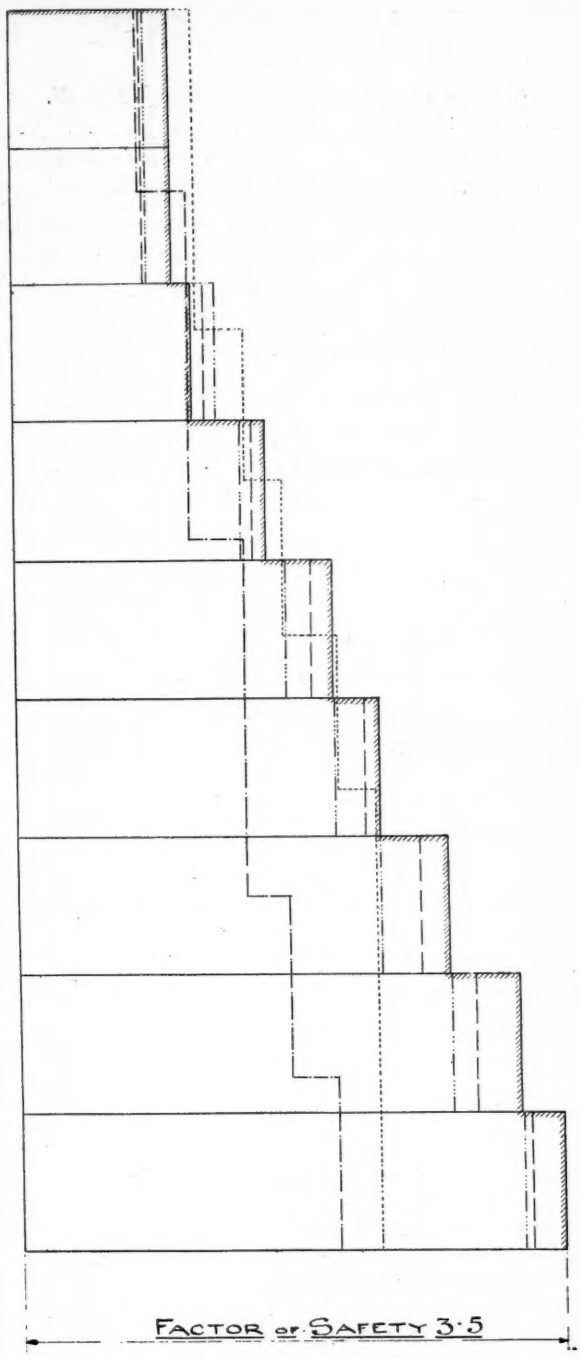
SIR,—The inquiry in your columns as to the cause of the bursting of the Ilkeston tank has brought to my mind an experience which, although it does not tend to form any solution, rather bears out the suggestion of Professor F. K. Th. van Iterson, in your issue of the 2nd ult.

I had cause to design a steel tank for a spiral-guided gasholder of rather large capacity—*i.e.*, 4½ million cubic feet; and, upon asking prices from the various contractors, we received from a few an alternative specification for a much weaker design, with, of course, a corresponding reduction in price.

I enclose a copy of the diagram I made at the time, illustrating the small margin of safety that competition forces the contractor to adopt. The shaded portions are my original design, which, needless to say, was eventually carried out.

F. G.

May 23, 1912.



Alliance and Dublin Gas Company.

SIR,—I am sure there are a large number of British investors who view, with concern, the low price of this Company's stock. As a holder of ordinary stock, I suggest that the proprietors on this side of the Channel combine together with a view of investigating the cause of the depressed market value, which should not only be standing considerably over par, but in receipt of a higher dividend under the sliding-scale.

NONULUS.

May 20, 1912.

What a Penny Will Do!

A correspondent writes regarding a paragraph appearing under this heading in the "JOURNAL" for the 14th inst. He sends a copy of a leaflet issued by his company as far back as May, 1909, which, as he truly says, shows that the opening words of the reference to Chichester are hardly correct. He remarks, in conclusion, "Why 'All Rights reserved' should be added, is surprising."

"Pyrites Cinder" for Gas Purification.

A correspondent, writing from the United States, says that, while recently in England, he was endeavouring to obtain information in reference to a reported method of gas purification, whereby pyrites cinder was to be used in place of bog ore. The process was supposed to originate with the pyrites cinder refuse from sulphuric acid works, which was either specially treated or mixed with a certain proportion of other material, and the resulting mass used for sulphur removal, instead of bog ore. As he was unable to obtain any confirmation of the rumour in reference to the use of this material, he asks whether any such report has come under our notice. Possibly some of our correspondents will be able to oblige by sending for publication particulars of the process alluded to.

South African Lighting Association.—The Directors, in presenting the accounts for 1911, report an increase in profits when compared with the previous year. The sales of gas at Port Elizabeth show only a small decline; and at Grahamstown there has been a satisfactory advance. There has been a further diminution in working expenses. The Directors have reduced the price of gas at Grahamstown as from Jan. 1, 1912. In consequence of the satisfactory increase in the profits, and the generally brighter prospects of trade, the Directors, after placing £1000 to reserve, recommend a dividend of 7½ per cent. for the year, free of income-tax (or a final dividend of 4½ per cent.), against 7 per cent. for 1910. A sum of £500 has been taken out of reserve to write-down still further the reserve investments. The profits to be carried forward will be increased to £1500 by the addition of £679.

The Water-Refining Company, Limited, has been formed with a capital of £500, in £1 shares.

LEGAL INTELLIGENCE.

SEQUEL TO THE "JOURNAL" LIBEL ACTION.

At the London Bankruptcy Court last Thursday, before Mr. Registrar Hope, the public examination took place of Louis Dosteel, trading as the Incandescent Supply Syndicate, and described as of 120, Earlsfield Road, Wandsworth. In reply to questions put by Mr. Daniel Williams, the Assistant Official Receiver, the debtor stated that he was a Russian Pole, and came to this country in 1884. Until 1894 he was a manufacturing perfumer, but had since dealt in incandescent gas sundries, lately under the style of the Incandescent Supply Syndicate, at 2, Gray's Inn Road, W.C. He alleged that his failure was due to lack of capital, and to his net profits on trading having been insufficient to meet his household and personal expenditure, but immediately to his liability for the costs of an action for libel, unsuccessfully brought by him in 1911 against the "JOURNAL OF GAS LIGHTING." The costs in the action amounted to £125. He formerly carried on business in Bassingham Road, Earlsfield; but he did not think he had any debts when he left there. He brought an action against the landlord of the premises, and won his action. He did not think he had been insolvent since 1895. He filed his petition to escape a committal for debt. When the libel appeared in the "JOURNAL OF GAS LIGHTING," he issued a writ against the proprietor of the paper, and the action was set down for trial. The libel imputed that he was a swindler, because he inserted certain advertisements in the newspapers. He advertised that he would tell people how to make gas-mantles at home if they would send him 5s. Only about a dozen people sent in their 5s. after the dissolution of his partnership with another person. Since 1910, the total receipts from this source would only be £3 or £4. He used to insert the same advertisements when he was in partnership, and he should think that about fifty people sent in 5s. each. The applicants were invited to purchase from him tools for which they had to pay 25s.; and he should think that about thirty people bought sets. The libel was in respect of the advertisements referred to, and it alleged that he was defrauding the public. He could not take the action to trial, because his Solicitors wanted a further £25 on account of costs, and he could not pay it. When the writ was issued, his Solicitor took the advice of Counsel, who said he had a good case. He had no notice of the trial of the action, and judgment went by default. On May 9, 1911, he gave a bill of sale to his brother-in-law, who was treated as a fully-secured creditor in his statement of affairs. The examination was ordered to be closed.

ACTION AGAINST THE WELSBACH COMPANY.

Claim for Wrongful Dismissal.

In the King's Bench Division of the High Court of Justice, Mr. Justice Hamilton had before him a few weeks ago the case of *Goodyear v. Welsbach Light Company, Limited*. It was an action brought by Mr. Robert John Goodyear to recover damages for alleged wrongful dismissal, and also for commission to which he said he was entitled. Plaintiff's case was that for many years he was a commercial traveller in the employ of the Sunlight Company; and by the terms of his agreement he was engaged for each year to Dec. 31, provided he did not at the end of the year give or receive three months' notice. The defendant Company subsequently acquired the business of the Sunlight Company; and it was part of the arrangement that they should take over all the Company's contracts and engagements. Plaintiff continued in the service of the defendants till November last, when he received a letter from the Manager cancelling his engagement, and offering him three months' salary and three months' commission. Plaintiff refused this, saying that his engagement lasted till Dec. 31, and that he was entitled to three months' salary after that date. He also said the commission offered was not sufficient. The defendants denied the alleged arrangement that the plaintiff could only be given notice at the end of the year, and said the Company were at liberty to give him notice at any time. They also disputed the plaintiff's claim for commission. After the case had been heard for some time, his Lordship gave judgment in favour of the plaintiff; holding that he was entitled to two months' more notice than had been given, and a further sum in respect of commission. The case came up again on Thursday, when, after prolonged legal argument, his Lordship made an order on the subject of costs; it having been stated that a larger sum had been paid into Court than had been awarded. The plaintiff had had the costs down to the date of payment into Court by the defendants, and also the costs of the issues as to notice and other matters on which he had succeeded. The money paid into Court would remain till after taxation, and there would be a declaration that the plaintiff was entitled to £223 10s. 6d. only. The costs of the applications after the trial would be the defendants'; and there would be a set-off.

Suicide at the Nine Elms Gas-Works.—At the Battersea Coroner's Court, last Tuesday, Mr. C. J. Oddy inquired into the circumstances attending the death of Harry Tumber, aged fifty, a painter employed at the Nine Elms Station of the Gaslight and Coke Company. Deceased was rather strange in his manner, and depressed at having lost his position owing to drink. He had been in an asylum, but early in the year appeared much better. He was engaged on Friday, the 17th inst., in painting the lower roof of the building containing the oil-gas plant, and was missed by a labourer. On search being made, he was discovered head downwards in a tar-vat quite dead. The vat was not directly under the roof, and the deceased was not likely to fall into it. Indeed, he had no business to be near it. Medical evidence was given as to the man's health and the condition in which he was found; death being attributed to asphyxia through immersion in tar. The Jury returned a verdict of "Suicide during temporary insanity;" adding a rider to the effect that a cover should be provided for the vat.

MISCELLANEOUS NEWS.

THE FATALITY AT STRATFORD-ON-AVON GAS-WORKS.

Prompt and Sympathetic Action by the Gas Committee.

At the Meeting of the Stratford-on-Avon Town Council on the 14th inst., the subject of the recent fatal explosion in the meter-house at the gas-works, an account of which was given in the "JOURNAL" a fortnight ago (p. 457), was considered before the ordinary business was proceeded with.

The MAYOR (Mr. F. Ballance) said he was sure all the members of the Council would agree with him when he said that they much deplored the deaths of the two employees Timms and Collins, and that their sympathies were with the widows and fatherless children. He thought, perhaps, that would be a favourable opportunity of saying that several people had asked him if he meant to open a fund; and one or two persons had given him money. But seeing that the men were insured under the Workmen's Compensation Act, and that the widows would get quite a respectable sum, he did not feel justified in making an appeal to the public. At the same time, he should be glad to receive any contributions; and, in conjunction with the Chairman of the Gas Committee (Councillor Everard), he would do his best either to invest the money judiciously or distribute it.

Mr. EVERARD, in moving the confirmation of the Gas Committee's minutes, said he wished to refer to a meeting of the Committee held at the gas-works on the 9th inst. In view of the accident, if he might so term it, the members were hastily called together. They first received a report from the Manager (Mr. J. S. Cranmer) as to what happened on the night of the explosion. They then unanimously resolved that a letter of condolence and sympathy should be sent to each of the widows of the two poor men who were fatally injured; and they felt sure the Council would support them in their action in voting £10 each for the widows for funeral expenses and immediate needs. [Hear, hear.] They next considered it their duty to call in a first-class expert to take charge, as it were, of the case, to advise them to the best of his ability as to the cause of the explosion, and to thoroughly investigate the matter. They had many offers of help from neighbouring gas managers, and the Committee appreciated them very much indeed; but they felt it was a case where they must call in an engineer, and one who was entirely dissociated from any gas-works. A small Committee was appointed to carry out this matter, and, without very much hesitation, on the information they obtained from various people, they decided to engage Mr. George Winstanley, of Kenilworth, who was recommended as one of the best men in the Midlands. A London man was suggested; but there would have been difficulty in securing him, and in such a matter they wanted to get someone on the scene at once. In regard to the men's compensation, he might say they were as fully insured as they could be. He might further say that the Committee felt, on the Town Clerk's advice, that they were liable for the broken windows. He wished to take the opportunity of mentioning one or two of the local managers who had proffered their services. Mr. Berridge came over from Leamington, Mr. Layton from Redditch, Mr. Haddock, who was at one time employed at the works, Mr. Hughes, from Smethwick, and two of Mr. Cranmer's sons—one from Willenhall and the other from Wolverhampton—who came over and did a great deal of useful work. They also received many letters offering assistance and advice from neighbouring gas-works.

The minutes were passed.

The Adjourned Inquest.

The inquiry into the death of the men George Collins and Arthur Timms was resumed at the Town Hall, Stratford-on-Avon, last Wednesday, by Mr. G. F. LODDER, the Coroner. Those present included Councillor E. Ballance (Mayor of Stratford), Councillor Everard (Chairman of the Gas Committee), Mr. J. S. Cranmer (Gas Manager), Mr. J. H. Rogers (Government Inspector of Factories), and Mr. R. Lunn (Town Clerk).

Mr. *Cranmer*, re-called, was asked by the Coroner if there were any electric lamps missing.

Witness: No.

Then the deceased could not have used one?—No.

I understand there was an explosion here some years ago in the same building?—Yes.

Can you give me some particulars of it?—It was about eight years ago, between five and six in the morning.

Was it a serious explosion?—Yes; it blew down the building, leaving only the walls.

Did you not find the cause of the explosion?—No.

Were there any men about at the time?—The foreman had just left the building, and was about 20 yards away.

Was there anything wrong with the meter then that you know of?—No.

Did you try to find out what was the cause of the explosion?—I did, but could never satisfy myself. I thought there might have been a leakage from one of the valves; but it was never proved.

Have you ever had reported to you an escape of gas in the meter-house?—Never.

When was the governor last adjusted? Did you ever have it adjusted?—No. It was not necessary, so long as it was acting properly.

Was the meter ever adjusted?—It was repaired two years ago.

What was wrong?—The bearings on which the spindle worked were worn away; and we had to have new ones.

Is the syphon that is there now the same that was there at the time of the previous explosion?—Yes.

A JURYMAN: Is it the duty of anyone to inspect the meter-house?

Witness: There are men in the meter-house a dozen times a day; and if there is anything wrong, it is their duty to report it.

Mr. ROGERS: When an escape of gas is found by a workman, what should he do?

Witness: He should report it either to me or to the foreman.

But if the escape is found at night, after you and the foreman have gone?—He should call one of us up.

Were electric lamps available that night?—The men are never allowed to use them. They are for the use of the foreman and myself.

The FOREMAN OF THE JURY: Suppose there was a bad escape, and neither you nor the foreman was available, what would happen?

Witness: The gas would simply escape through the roof.

A JURYMAN: Would it not be safer to keep the meter-house always locked?

Witness: It is supposed to be always locked; but if a workman happens to be there, and intends to come back in a quarter-of-an-hour or twenty minutes, he might leave the key in the door.

The FOREMAN: Then any workman might go into the meter-house casually smoking his pipe.

Harry Thomas, employed at the gas-works, said he saw the dead man Collins at about 8.25 on the night of the accident. He was then quite sober. Witness could not say that he had ever seen Collins drunk on the premises; but there were times when he had been "a bit merry." Witness did not think that he had ever been careless in his work.

Frederick Soul, also employed at the works, said he went to the meter-house on the night of the accident, and changed the outlet-valves of the holders. He opened the outlet-valve of one before he closed the outlet-valve of the other. Everything was all right when he left the works.

The CORONER: Have you seen any smoking about the place.

Witness: Oh, yes.

When was the last occasion?—I could not exactly say.

Have you seen smoking there on many occasions?—Several times.

Are you not all told to be careful about what you do in the meter-house?—Yes.

Do you not think it was your duty to report anything of this kind you saw?—We were never ordered to do so.

Did you not know that it was dangerous?—Yes.

Is there much slackness at the works? Do you do things that you do not let the Manager and foremen know about?—Oh, no.

What would you expect, if the Manager caught any of you smoking there?—Dismissal.

The FOREMAN: Who was the man you saw smoking there?

Witness: The present foreman.

The CORONER: Have you seen him smoking there often?

Witness: Well, on different occasions.

And other men too?—No.

Mr. ROGERS: How often do you go into the meter-room between 8 o'clock and midnight?

Witness: At 10, 10.30, 11, 11.30, and 12.

John H. Bigg, foreman of the works, said he had been there thirteen months. He was not at the works when the explosion occurred, but arrived soon afterwards. He had left the works shortly after eight, having previously looked round and found everything right. He did not go into the meter-house at the time. No gas escapes had been reported to him for some time.

The CORONER: Do you allow smoking in the meter-house?

Witness: No.

Are you a smoker yourself?—Yes.

Have you ever smoked in the meter-house?—No.

You have never smoked there?—Not that I remember. I may have gone in there with a cigarette in my mouth; but it was always unlighted. That would only be in the evening, when I was walking round.

You have had trouble with the ascension-pipes?—Yes.

Have you had any since this inquiry opened?—Well, there is always bound to be some; but we have had less since we have had larger augers.

A JURYMAN: Do you not think it very unwise to go into the meter-house with a cigarette in your mouth? You are the foreman, and ought to set an example to the workmen.

Witness: I try to.

It seems to me that you are doing anything but setting an example to go in there with a cigarette in your mouth?—There would be no other men about then; and in the ordinary way there is no danger there.

Mr. ROGERS: Was the window open that night?

Witness: I am not positive.

If a workman discovers an escape, what should he do?—Report to me or the Manager.

And then you would use the electric lamps?—That would depend on whether it was light or dark.

The FOREMAN: Have you had any trouble with the men since you have been here?

Witness: Yes.

Over what?—Because they have had to work harder since I have been here.

I think you have wanted to have a bigger make of gas than before; and there has been unpleasantness?—Yes.

A JURYMAN: You say you have been in the meter-house with a cigarette in your mouth, but that it has been unlighted. Might you not have gone in with one in your mouth, not knowing whether it was lighted or not?

Witness: I think I should know that.

The FOREMAN: Will you swear that you have never been in with a lighted pipe or cigarette?

Witness: I will not go so far as to swear that.

ANOTHER JURYMAN: If these lamps outside were not lighted, would it have been possible to see the back of the meter?

Witness: Yes.

A REPORT BY MR. FLETCHER W. STEVENSON.

The CORONER then read the following report (addressed to him) drawn up by Mr. FLETCHER W. STEVENSON, of Coventry.

On Friday, the 17th inst., I met you in Stratford, and after hearing from you some of the principal evidence given at the inquest on the death of the two men, Timms and Collins, caused by an explosion of gas in the meter and governor house at the Stratford Gas-Works, I proceeded to the gas-works. You desired me, if possible, first to discover how the escape of gas occurred, and how it was ignited and so caused the explosion.

I was met at the works by Mr. Cranmer (the Manager) and by the Chairman of the Gas Committee, and further in the investigation made was assisted by Mr. George Winstanley, the Gas Committee's expert, and by Mr. Cranmer's son; and every facility was afforded me by these gentlemen. At the time of my visit, the meter and governor house, in which the explosion occurred, was cleared of all *débris*, pipes fractured or leaking from the result of the explosion had been repaired, and the meter removed from its position for repairs.

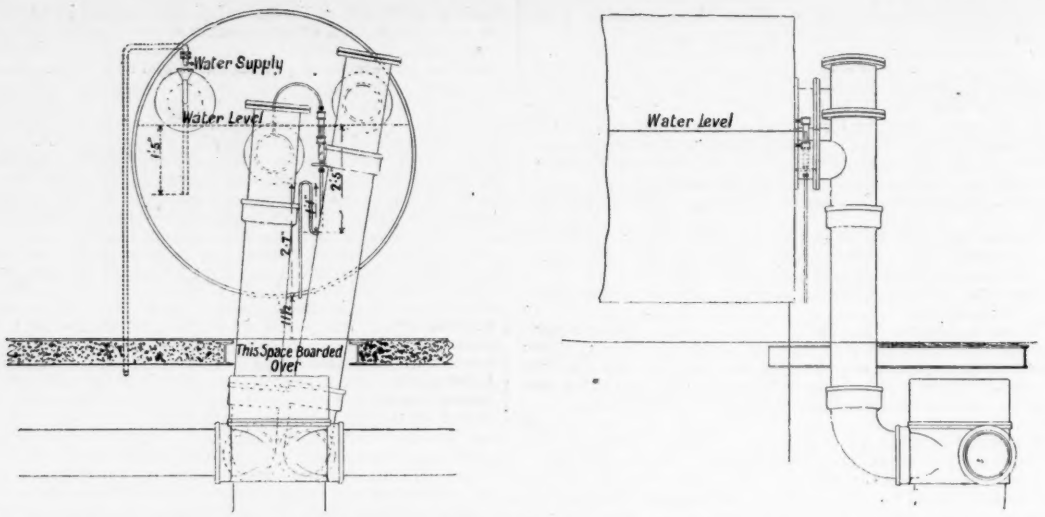
You have in evidence the size and construction of the building and the apparatus it contained; therefore I need not describe these. But I would quite endorse what Mr. Cranmer said in his evidence—that the grouping of the meter, governor, and valves in one building is usual in medium-sized gas-works, and is good engineering; and it has nothing, in my opinion, to do with the escape of gas and resulting explosion. You will understand that I could not examine for myself the condition of the mains, syphons, or valves in the neighbourhood of the building, as these had been exposed and repaired where necessary before I came upon the scene. But from what I saw, I should judge that there had not been any leakage of long duration from pipes outside the building that might have found its way inside. Moreover, the evidence is clear that no smell of escaping gas was observed in the building up to 5.30 p.m. on the day the accident occurred. One man (F. Clark) told me he was in the building cleaning at about 10 to 11.30 a.m. that day; and another (Fred Soul) said he was in the building at 5.30 p.m., and changed the outlet-valves of the gasholders. He stated positively that he opened the outlet-valve of one before he closed the outlet-valve of the other, and, further, that he did not touch the inlet-valve to the gasholders. This is important, because if the inlet-valve to one of the gasholders had been closed before the other was opened a back-pressure would have been thrown upon the meter. I came then to the conclusion, on these facts, that there could not have been an escape finding its way into the building until after 5.30 p.m. It therefore must have occurred suddenly, and have been a serious one. I then further eliminated the station-governor from a possible cause of the escape, as, had this been the cause, it would at once have affected the lights about the works, in the Manager's house, and generally through the town.

Mr. Winstanley then drew my attention to the station-meter, which, as I have mentioned, had been removed from the building for repairs. This meter is a large enclosed cylindrical tank about half full of water, and contains a drum inside which measures the gas as it revolves. In order to ensure correct registration, the water must be kept up to a uniform level, predetermined by test when being erected. There is a pipe passing through the back of the meter, sealed deep in the water inside, and having upon the upper and outside a funnel, into which water is run periodically, or, in the case of very large meters, continuously. An overflow is provided on the back of the meter, outside the latter, to allow the surplus water from the meter to run away in a drain in the basement. In order to prevent gas escaping and passing away with the water, or when there is not any water being run in, a syphon-pipe is attached, through which the water has to flow. This syphon, on the Stratford meter, is peculiar, inasmuch as the lower leg is about 1 ft. 6 in. longer than the bottom of the syphon. Mr. Winstanley has made rough tests to find the quantity of water left in the syphon after it had normally run itself out, and was surprised to find the quantity so small that it seemed a wonder it would stand 6 inches pressure, which I was told was the normal pressure of the gasholder when cupped. From the inlet-pipe to the meter a $\frac{3}{8}$-inch lead pipe is taken to the water-overflow. The meter will take about $\frac{1}{4}$ inch pressure to work it; so that there is about $6\frac{1}{4}$ inches pressure of gas on the water overflow-pipe to the syphon, whenever the gasholder is cupped; and if then from any cause the water-seal in the syphon is broken, gas will follow. The bottom of the syphon was within about 12 inches of the floor of the building. The floor at this particular point is made of loose boards; and through these the water found its way to the drain each time water was run into the meter. Mr. Winstanley's suggestion to me was that, under certain conditions, the water-seal in the syphon could be broken, and that gas would follow; and this is what probably happened between 5.30 and 8.30 p.m. on the evening of the accident. I quite agree with him that it was possible, but suggested that we ought to have more proof.

I therefore on Sunday last made up at the Coventry Gas-Works an arrangement (the only actual part of the Stratford outflow used, however, being the syphon); and with this could readily at times blow the seal at 5 or 6 inches pressure, while I could at others get it to stand a pressure of 8 inches without blowing. I felt, however, this arrangement was not closely enough similar to the Stratford one; and I therefore yesterday made a model to represent the meter under just the conditions it was actually working, and used the actual overflow from the meter. Mr. Winstanley saw this model; and we made tests with it, and found that, given certain conditions, the syphon could be blown with 6 to 7 inches pressure, and air (which we were testing with instead of gas) would follow. We made many trials with this model, and were satisfied that the gas could have escaped at Stratford in this way.

There is the evidence of Timms that he heard water running from the back of the meter. This would probably be after the seal in the syphon had been broken, and gas was bubbling through the small quantity of water left. I think, therefore, that Timms' evidence makes it conclusive that what we found in experiments could occur had occurred on this occasion, and that gas causing the explosion escaped from this syphon-pipe at the back of the meter.

With regard to how the explosive mixture was ignited, I am afraid it is impossible to say. There were two lamps hanging, one outside each of two windows on the gasholder side of the building. These windows are stated to have had a small central portion open, but were generally closed. The lamps were not, I am told, lighted at the time of the explosion; only the bye-passes were alight. The projection of the centre of the lamps from the building was 18 inches; and I think it is almost impossible that the explosive mixture could have been ignited



The Station Meter—10,000 Cubic Feet per Hour Capacity—and its Connections at the Stratford-on-Avon Corporation Gas-Works.

[Scale: Quarter Inch to the Foot.]

by the bye-pass jets, even if the windows were open. The mixture, in escaping into the open air, would, in my opinion, be too weak to ignite. The only other solution of the ignition I can see is that one of the men struck a light accidentally, or on purpose; believing the escape to be only slight, and not explosive.

Mr. *Stevenson* was then sworn, and, in reply to the CORONER, said he did not think that, even if the lamps outside had been lighted, they could have caused the explosion.

The CORONER: It is not unusual for the pipes in the retort-house to be obstructed?

Witness: No; and I do not think that had anything to do with the explosion.

Even supposing the pipes got thoroughly choked, there would be no danger?—No, no particular danger.

Is this form of outlet customary?—Yes. I have seen some longer than this; but it is not a good practice.

Mr. ROGERS: Do you consider the ventilation of the meter-house adequate?

Witness: I think there might with advantage be more ventilation.

Is it customary to have meters in enclosed rooms?—Yes; almost universal.

The CORONER: Do you think that a spark caused by a man tripping up, or anything of that kind, could have ignited the mixture?

Witness: It is just possible, but very unlikely, I think.

MR. GEORGE WINSTANLEY'S EVIDENCE.

Mr. *George Winstanley* said he had heard the evidence of the last witness, and agreed with it.

The CORONER: The condition which led to the escape would not be likely to occur frequently?

Witness: It might not obtain for years, or it might obtain any day.

You are satisfied that the explosion occurred in the basement?—Yes. It could not possibly have happened at the top. It was in a confined space.

Mr. ROGERS: Is it desirable to have a confined space like that?

Witness: There are many rooms built in this way. I think it is desirable to have rather more ventilation than there was in this case.

Police Constable *Hawkes* said he had searched the clothes of the two deceased men, and had found nothing in them.

SUMMING UP AND VERDICT.

The CORONER, in summing up, said it was now clear that there was nothing in the suggestion made when they last inquired into the matter, that the stopping of the pipes had anything to do with the explosion. The evidence of the experts had established, he thought, how the escape occurred. It was clear, however, that the gas could not have exploded spontaneously; it must have been ignited by a light. They must remember that men who worked in dangerous callings became somewhat callous; and it should also be remembered that these two men were working with the smell of gas about them all day. They might have thought the escape was a slight one, and one of them might have thoughtlessly lighted a match. He remarked that Collins had not been a temperate man; and it might have been better that a man of this character should not have been employed at a place like a gas-works, where the surroundings were so dangerous. He had no doubt that the point raised about the ventilation of the meter-house would receive attention.

The Jury, after a short absence, returned a verdict to the effect that Collins was killed by an explosion of gas at the Stratford Gas-Works; and that Timms died from injuries received from the explosion. They also found that the explosion was caused by leakage of gas from the water overflow-pipe of the station meter, but that there was not sufficient evidence to show how the gas became ignited.

The CORONER said it must be a source of great satisfaction to the members of the Gas Committee and others concerned to know what led to the explosion. He wished to acknowledge the great help he had received from all the officials.

REGULATING THE TEMPERATURE OF GAS-PRODUCERS.

The Doherty Patents Upheld.

We learn from "Progressive Age" that the United States Circuit Court of Appeals for the First Circuit has given a judgment sustaining the earlier decision of the United States Circuit Court of Massachusetts in favour of the complainant in the action brought by the Combustion Utilities Corporation against the Worcester Gaslight Company. The question at issue in both Courts was the validity of the patents of Mr. Henry L. Doherty, covering a means of controlling and regulating the temperatures in gas-producers. While the present case had to do directly with the use of the process and apparatus in connection with retort-benches, the patents cover the application of the devices to any gas-producer for any purpose.*

The Combustion Utilities Corporation control the Doherty patents; and the action was to restrain the Gas Company from using retort-benches installed for them embodying devices infringing the patents. The defendant submitted that the inventions had been anticipated, and were therefore invalid; but the complainants claimed that both the process and the apparatus were new and distinct. The trial before Judge Brown in the Lower Court resulted in a decision in favour of the Corporation. It developed the fact (to quote the words of the Court) that Mr. Doherty "produced a new result in the art—a practical non-clinkering gas-producer furnace—and made an important contribution to the art by the disclosure of what could be practically accomplished by a new way of applying old means."

The patents in question cover both an apparatus and a process embracing the use of a part of the products of combustion, properly mixed with air, in such a way as to keep the temperature in the incandescent bed of fuel in the furnace below the point at which the ash can fuse or flux into a clinker. The result is a retort-bench free from the trouble and expense attendant upon the presence of clinker in the furnace. The Doherty process, moreover, accomplishes this not only at no fuel cost, but with an actual increase in fuel economy.

Owing to the importance of the questions at issue, the trial of the case commanded widespread attention, and brought forth legal and engineering talent of the highest order on both sides. It developed an unusually thorough investigation of the principles and methods of combustion, and the distinctions in many cases called for discrimination on points of both law and science.

Judge Brown, in the first decision, stated that "a very protracted and careful examination of the record convinces me that Doherty made a meritorious advance in the art; and that he was the inventor both of an apparatus and a new process." The process patent covers the use of a part of the waste products of combustion, mingled with air, to restrain temperatures; and the apparatus patent provides for the means and methods employed to regulate the mixture of air and diluent gases.

The case was carried on appeal by the defendants to the Higher Court; and, after deliberation, the Court of Appeals—the three Judges unanimously concurring—sustained the decision of the Lower Court in every respect. Mr. Doherty's patents are thus fully established beyond further question, and business interests which have been in abeyance pending a final settlement of the action will now adjust themselves to the new conditions.

* The process was described and illustrated in the "JOURNAL" for Sept. 6, 1910 (p. 657); and the decision of the Lower Court was noticed in the number for Oct. 31, 1911 (p. 332).

Abercarn Gas Undertaking.—The draft balance-sheet of the Gas Department of the Abercarn Urban District Council, as submitted to the Gas Committee by the Manager (Mr. J. A. Brentnall), shows on the past year's working a gross profit of £3053—an increase of £365 compared with the previous year. After deducting loan charges, interest, &c., there is a net profit of £734, against £20 before.

BIRMINGHAM GAS UNDERTAKING.

At last Tuesday's meeting of the Birmingham City Council, there was presented the report of the Gas Committee which was noticed in the "JOURNAL" of that date (p. 533).

Alderman Sir HALLEWELL ROGERS, in moving the adoption of the report, said the effect of the coal strike upon the department was so unprecedented that they had dealt with it fully. He wished to point out that, while they were aware many months ago of the probable unrest in the coalfields, they never anticipated the position would be complicated by the railway strike which took place in August last, and which, coupled with the severe snowstorms early in the year, rendered it impossible to get the coal they had ordered. They had contracted for larger quantities than in the previous year. The result was that, when the strike came, their stocks were several thousand tons lower than they ought to have been. Then, again, the stocks were further reduced by the exceptionally heavy output of gas during the months of December, January, and February. This output was as much as 226½ million cubic feet more than in the corresponding period of the previous year. In other words, the increased output in Birmingham during those three months was sufficient for the town of Warwick for three years. He wished to correct an impression that Birmingham was the only city where a curtailed supply had to be resorted to. There were no fewer than twenty important towns, and several smaller ones, where it was found necessary to restrict the supply to a greater or smaller extent than Birmingham. Dealing with the accounts, he said the sale of gas had decreased by £24,000 compared with last year, and this in spite of the fact that the consumption was more in 1912 compared with 1911 by 395¾ million cubic feet, or 5·14 per cent. The decrease in the receipts was brought about by two reductions in price which had operated during the financial year. Profits had increased, thanks to the increased prices they obtained for residual products. They had not increased the price of coke. When the coal strike took place, they decided not to do so. They supplied the bakers and philanthropic institutions; but there were also thousands of people whom they allowed to have coke in ¼ and ½ cwt. baskets, and the Committee did not think it right to take advantage of them. The net profit for the year was £80,681, against £75,621 last year.

Mr. DUGGAN inquired whether the Gas Committee would consider in future that a contribution of £50,000 per annum to the relief of the rates was sufficient, and that all surplus over this sum should be utilized in the reduction of the price to the consumers.

Alderman PRITCHETT asked if it was the intention of the Committee, in view of their experience, to increase the normal working stock of coal?

Alderman Sir HALLEWELL ROGERS said they got down during the strike to about 6000 tons; but at the present time the stocks amounted to 73,000 tons, representing, at this season of the year, eight weeks' working supply. The Council could rest assured that the Committee intended to keep the stocks of coal as high as possible. In regard to the question put by Mr. Duggan, he pointed out that the Committee had no option to do otherwise than hand over their balances at the end of each financial year towards the improvement rate. For this reason, he came to the Council in January last with a recommendation that the Gas Department should decrease the price, which meant a concession of about £20,000 to the consumers. He agreed that £80,000 was a big sum; but at present there was a loss on the water, and therefore the Gas Committee had been giving more towards the reduction of the rates than perhaps they ought.

The report was adopted.

LEICESTER AND VERTICAL RETORTS.

The Labour Saving Aspect.

There was a long discussion at a special meeting of the Leicester Town Council last Tuesday, arising out of a proposal to instal vertical retorts at the gas-works.

The Gas Committee reported that they had for some time past been considering the latest developments in coal carbonization—having been impressed by the information gained on Continental visits by the late Chairman and the late Engineer (Mr. Alfred Colson). As a result of investigations made, the Committee felt that they could confidently submit for the consideration of the Council a scheme to materially reduce the cost of carbonization and to obtain improved results. The Council would recollect that on Nov. 30, 1909, they passed a resolution giving intimation to each Committee that no labour-saving machinery would be sanctioned until alternative employment could be found by the Council for labour displaced. The Gas Committee recognized that the adoption of the scheme proposed must result in a considerable decrease in the amount of labour employed; and having in view this resolution of the Council, they thought the matter of such importance as to make it their duty to report the whole subject for the consideration of the Council. They recommended that the resolution in question be rescinded. The Committee had no hesitation in recommending the Council to adopt the Glover-West system of vertical retorts. Careful coal tests had been made with excellent results. The chief advantages to be obtained by establishing a system of carbonization by vertical retorts were: (1) The conditions of employment were improved, and there was a great saving in the amount of labour employed; (2) greater production of gas per ton of coal consumed, and consequent saving in quantity of coal required; (3) increase in residual products per ton of coal; (4) saving in coke; and (5) absence of nuisance from the plant and economy of ground space. As an illustration, it might be observed that last year 179,535 tons of coal and equivalent were carbonized, producing 2,150,888,000 cubic feet of gas. The maximum quantity of gas produced by both the Aylestone and Belgrave Gate works during 24 hours was less than 10,000,000 cubic feet. The total of carbonizing wages at both works was equal to approximately 2·12d. per 1000 cubic feet of gas sold. With vertical retorts, their Engineer (Mr. Hubert Pooley) was of opinion that this cost could be reduced to 0·75d. From these data, and allowing for the economy in coal, the saving to be made was calculated to involve probably some £6000 per annum. The Committee recommended that the tender of West's Gas Improvement Company, Limited, of Manchester, at the sum of £37,056, for an installation of vertical retorts for the Belgrave Gate works, be accepted. The Committee had for some time felt it important to make further storage provision in respect of the gas made at the Belgrave Gate works. This involved either the means of conveying the gas to Aylestone or the acquisition of further land at Belgrave Gate. The Committee had obtained an option to purchase about 6795 square yards of land adjoining the works at 12s. per square yard. In addition, there would be a sum of £435 in respect of money expended upon street making. They had been advised that the amount asked was a reasonable one under the circumstances; and they recommended the Council to authorize the purchase of the land and the borrowing of the necessary capital.

Alderman SMITH, in moving the adoption of the report and the rescinding of the Council's resolution referred to therein, confessed that it was not a pleasant matter for himself or the Council, but said he was going to perform it, no matter what the consequences. The Finance Committee thought it bad policy to defray the cost of the vertical retorts out of the reserve fund; and the Gas Committee recommended, as an alternative, that the present value of the existing retorts and other plant which must be dismantled be written-off from revenue account in the form of "repairs," or taken from a renewals fund which might be created before the new retorts were established, and that the balance of the cost be provided for by a comparatively short-date loan, to be repayable (say) in ten years. With the vertical retorts, the Committee estimated that the saving in labour would be £4925 per annum. There would also be a saving of 2500 tons of coal, of a money value of £1375. The total saving on the first instalment of the new system would, therefore, be £6300 per annum; and when the system was in operation at both the Belgrave Gate and Aylestone works, the yearly saving would be £15,000. In moving the rescinding of the resolution of Nov. 30, 1909, he hoped the Committee would not be taken as being in any way opposed to the employment of labour. They were advised that while this resolution stood on the minutes, it blocked the way to the introduction of all up-to-date labour-saving methods and appliances necessary to progress. It was a relic of bygone times; and in this age no sane person, worker or capitalist, could reasonably hope to stop progress by opposing the introduction of scientific methods designed to improve modern industrial and commercial conditions. Under the Committee's new scheme, labour would be displaced; and he would at once say that every effort should be made to provide for the men affected. The number likely to be displaced by the first instalment of the vertical retorts would be about 70 season men, and about 58 permanent men. The displacement would be gradual; and the 58 permanent men might be largely absorbed in other departments of the Corporation which employed labour. He was confident the Gas Committee would receive the support of the other labour-employing Committees in finding work for the men.

Alderman BANTON, in opposing the motion to rescind the resolution, said the Labour party were not against the introduction of labour-saving machinery; but they would not have it displacing labour, unless there was an alternative and definite scheme for giving these men re-employment.

Mr. WALKER said he could not bring himself to vote for the rescinding of the resolution. He was not opposed to the introduction of machinery; but when they could not find work for the men who were displaced, he would sooner pay the price they did to-day and keep the rates where they were.

Mr. BAKER urged that, as a Corporation, they ought to be model employers; but if they went further, they would overstep the lines of justice and fairness. He was of opinion, however, that it was not necessary to dismiss a single man who was now working for the Gas Department. He would sooner lose all the benefits to be derived from the cheapening of gas than that a single child should starve. In the cities and towns in this country in which such machinery was introduced, nothing was done for the men; but in Vienna and Berlin not a single man was displaced, owing to the increased consumption.

Alderman CHAPLIN said they were agreed as to the advisability of introducing improved machinery; but if they were not certain that they could find work for the men who would be displaced, he would vote against the motion before them. The matter should be allowed to stand over until there had been a wider opportunity of seeing whether it was possible to do something for the men who were going to be thrown out of employment.

Alderman Sir WILLIAM VINCENT thought that, if careful consideration was given to the question, they would be able to employ all the men in the Gas Department.

Alderman SMITH said he was legally advised that the Council could not consider the question of installing the new machinery until the resolution on the books was rescinded. The point before the Council was whether work should be found for the displaced men. As far as the Gas Committee were concerned, he agreed that work should be found; but they could not do this until the installation of the new machinery was approved.

Mr. SHERIFF said it seemed to be illegal to do one thing in the Council Chamber and legal to do it in the Committee-room. He entered an emphatic protest against the way the matter had been manœuvred.

Alderman SMITH ultimately agreed to take back this portion of the report, pending the holding of a special meeting of the Council.

The part of the report relating to the purchase of land adjoining the Belgrave Gate works was then approved.

As will be seen from an announcement which appears elsewhere, the Newport (Mon.) Gas Company are inviting tenders for an issue of £8000 of consolidated 5 per cent. stock, in lots of £100, at a minimum price of £110 each. Full maximum dividends have been paid by the Company for upwards of fifty years.

LEEDS GAS-WORKS SURPLUS.

The Leeds Gas Committee met last Tuesday, under the presidency of Mr. G. Ratcliffe, and considered the accounts for the past year.

These showed that the total revenue for the year was £384,417, and the expenditure £266,257, leaving a gross profit of £118,160. This compares with the previous year's gross profit of £111,743. From this gross profit £3136 has been deducted for income-tax, £46,541 for interest, £42,076 for redemption fund, £1591 as revenue contribution to capital outlay, and £2592 as provision for repayments of stoves—leaving a surplus of £22,223 to be transferred to the city fund in aid of the rates. Last year £18,100 was granted to the city fund for this purpose. The Committee considered the result all the more satisfactory, inasmuch as the revenue from the sale of gas had decreased by practically £4000, due to the smaller consumption during the coal strike. The amount expended on capital account during the year was £14,055, principally on extensions of mains, meters, and gas-stoves. There has been a gradual decrease of the capital account during the past few years. The total capital expenditure to March 31 last was £1,936,318. During the past twelve months, the net debt on capital account has been reduced by £28,737; and it now stands at £1,221,365, as compared with £1,365,408 in 1905—a decrease of £144,043 since that year. A resolution was passed sanctioning the borrowing of a sum £30,000 for mains and gas-stoves, to extend over the next three years.

Mr. R. H. Townsley (the Gas Manager) reported that since the coal strike supplies had been coming forward very satisfactorily, and that, in addition to meeting all present requirements, it was possible to replenish the exhausted stock. The Committee unanimously passed the following resolution: "That this Committee place on record their high appreciation of the services of the Gas Manager (Mr. R. H. Townsley) and his staff during the recent coal strike."

COVENTRY CORPORATION GAS UNDERTAKING.

The Past Year's Working.

In the last number of the "JOURNAL" (p. 534), we gave the principal figures from the accounts of the Gas Department of the Coventry Corporation for the past financial year. The available surplus, it may be remembered, was £24,554, compared with £19,384 for 1910-11.

Commenting upon this highly satisfactory result, when moving the adoption of the Gas Committee's report at the meeting of the City Council last week, Alderman Batchelor, the Chairman, observed that the past financial year had been one of records all round. The sales of gas had been greater, the yield of gas per ton of coal carbonized larger, and the quantity of gas unaccounted for lower; while the surplus showed an increase. He thought it was hardly to be expected that the Committee would be able to maintain all these records. In fact, it was quite possible that they had reached high-water mark as regarded the yield of gas per ton of coal carbonized. Dealing with the sale of gas, he said the supply to ordinary consumers amounted to 668,389,600 cubic feet; to consumers through prepayment meters, 264,118,300 cubic feet; and for public lighting, 28,907,151 cubic feet—making a total of 961,415,051 feet. This showed an increase of 61,440,451 cubic feet over the previous year, or 6·39 per cent.; and it was mainly due to the users of prepayment meters. Last year they made a reduction to these consumers of 1d. per 1000 cubic feet—an estimated loss of revenue of £923 for the year. The increase in this class was £5292, and in that of the ordinary consumers £1166. The accounts showed an improvement of £5050 in the receipts from the sale of residual products, though the actual quantity of coal carbonized was less—higher prices having been obtained. The yield of gas per ton of coal carbonized had been 12,051 cubic feet, against 11,354 cubic feet before, which meant an economy of 5204 tons in the coal used, or equal to a saving, less the value of residuals, of £1258. Coming to the financial results of the working, Alderman Batchelor stated that the gross profit amounted to £45,817, compared with £40,690 last year; and there was a net surplus of £23,670, against £18,632—an increase of £5038. To this had to be added the sum of £884 brought forward; making a total of £24,554. Having referred to the Committee's recommendation in regard to the disposal of the profits, as given in the "JOURNAL" last week, he remarked in conclusion that it was quite possible that in five years' time the Gas Department might have to apply for sanction to erect a further section of the works, and to borrow capital for it. If they devoted excessive sums for the relief of rates, they would be in difficulties with the Local Government Board when they came to make their application for permission to proceed with the new portion in question.

In seconding the motion, Mr. White paid a tribute to the excellent management of the undertaking by Mr. Fletcher W. Stevenson, and referred particularly to his foresight in making adequate provision as regards coal supplies at the time of the miners' strike.

The discussion which followed turned mainly upon the distribution of the year's surplus; the view being put forward by some speakers that a larger contribution should have been made to the rates. It was proposed to increase the amount from £5000 to £6000 by taking £1000 from the sum set aside to meet the loss of capital on the abandonment of plant at the old works. Attention was also drawn to the upward tendency of local rates; and it was submitted that the ratepayers, who were called upon to make up any losses on trading departments, should receive every consideration. On a division, the report was adopted.

The Committee afterwards submitted a further recommendation providing for an all-round reduction of 2d. per 1000 cubic feet in the scale of charges. Alderman Batchelor, in proposing this, said that on the present basis of consumption the reduced scale would represent about £8000 per annum less revenue; but all past reductions had led to an increased consumption of gas, and there had been no falling-off in receipts. The Council adopted the amended scale, which ranges from 1s. 6d. per 1000 cubic feet in the case of consumers of 4 million feet per annum and upwards to 2s. 2d. for those burning less than 200,000 feet; while prepayment consumers will be charged 2s. 10d.

SMETHWICK CORPORATION GAS DEPARTMENT.

The Past Year's Working.

The Secretary of the Gas Department of the Smethwick Corporation (Mr. W. J. Sturges) has presented to the Gas Committee his report for the year ended the 31st of March, together with the accounts for this period duly certified by the Auditors, Messrs. Carter and Co., of Birmingham. The report furnishes the following particulars.

The total income on revenue account amounted to £71,273—an increase of £888 compared with the year 1910-11. There was again a very satisfactory increase in the sales of gas, the revenue from which came to £55,651, compared with £52,994 before; being an increase of £2657. The reduction in the price of gas to prepayment consumers amounted to £838 on the three quarters during which it was in operation, and the reduction from 2s. 7d. to 2s. 5d. per 1000 cubic feet to small consumers came to £597; making a total of £1435. The consumption of gas through prepayment meters increased 16·5 per cent.; ordinary consumers at 2s. 5d. took 5·12 per cent. more, those at 2s. 3d. took 7·49 per cent. less, and those at 2s. 2d. took 1·57 per cent. less. The consumption of gas for power and manufacturing purposes rose 18·87 per cent. The total quantity of gas sold and accounted for was 494,253,100 cubic feet—an increase of 35,728,300 cubic feet, or 7·79 per cent., compared with the previous year; that unaccounted-for being 28,128,900 cubic feet, or 5·38 per cent. of the gas sent out.

There were 95,690 collections from prepayment meters during the year—averaging 3s. 10d. per collection, against 3s. 5d. in 1910-11. The average amount collected per meter was 40s. 9d., against 39s. 7d., with a consumption per meter of 13,269 cubic feet, compared with 11,875 cubic feet. The number of meters fixed at the end of the year was: Ordinary, 3844; prepayment, 9110—an aggregate of 12,954, or an increase of 341. The number of cooking-stoves fixed on hire was 2350; being 544 more than at the end of March, 1911. There were also fixed during the year 882 grillers, supplied free to prepayment consumers, and 58 outside shop lamps on the hire-purchase system; bringing up to 198 the total number so supplied.

The total expenditure on trading account was £51,117, against £49,553 before—an increase of £1564. The cost of manufacture, including the maintenance and renewal of works and plant, shows an increase of £632; but worked out on the quantity of gas made, the cost is 1s. 5·72d., against 1s. 6·87d. per 1000 cubic feet—a saving of 1·15d., equal to £2516 in favour of the year under review. The principal items—viz., materials for carbonizing, purifying, and wages—show reduced charges, notwithstanding the largely increased quantity of gas produced. The expenditure in connection with the distribution of gas, which includes the free fixing of service-pipes, meters, stoves, and grillers, was £92 more than in the previous year; and there was a slight saving on the maintenance of the public lamps. The value of the public lighting—viz., gas at 1s. 8d per 1000 cubic feet, *plus* maintenance expenses of lamps—contributed free of charge, was £4380, or a decrease of £85; allowance being made for 981,000 cubic feet of gas, the estimated quantity saved by the reduction of public lighting during the coal strike.

The gross profit on the year's trading was £20,156. Comparing this with the £20,832 of the previous year, Mr. Sturges says consideration must be given to the reduction in the price of gas (which, as previously pointed out, amounted to £1435), and to the unavoidable loss due to the decreased production of coke and other products. The balance standing to the credit of the profit and loss account at the commencement of the year was £7108, to which has been added the gross profit for 1911-12—viz., £20,156—and £924 for accumulated interest allowed by the bank. After charging the necessary provision for interest on loans and the redemption and extinction of the debt on the undertaking, amounting in the aggregate to £10,366, there remains as the net profit £10,714, compared with £10,458 before. Deducting the item of £4380 for public lighting, contributed in aid of the district rate, a balance of £6334 remains to be transferred to the credit of the extensions fund account; and the profit and loss account closes, as in previous years, with a carry-forward balance of £7108.

SHIPLEY GAS UNDERTAKING.

In his annual report to the Gas Committee of the Shipley Urban District Council, the Gas Engineer (Mr. H. Blakey) says that the gross profit on the undertaking for the year to March 31 is £17,851, which is the largest yet made by the department, and £2344 in excess of the previous year. After setting aside £14,780 for interest and sinking fund charges, there remains a net surplus of £3071. It having been decided to charge the new coke-conveying plant to revenue account, £1690 has been used for this purpose, leaving a surplus for the reserve fund of £1381. The net profit per 1000 cubic feet of gas sent out is 4·06d.; whereas for the year to March, 1909, there was a net loss of 1·45d. The total quantity of gas made during the past twelve months was 181,641,000 cubic feet—an increase of 6,019,000 cubic feet, or 3·43 per cent., on the previous year. The make per ton of coal carbonized was 11,034 cubic feet, or an increase of 211 cubic feet, resulting in a saving of 313 tons of coal, or £172. The saving in coal during the last two years is equal to 863 tons, or £484. The quantity of gas unaccounted for in the past year was 15,169,448 cubic feet. There are now 5160 ordinary consumers, and 3747 prepayment meter users; the total of 8907 being 213 more than twelve months ago. The number of street-lamps fixed in the area of supply (all on the incandescent system) is 1306. The receipts from residuals are equal to a net return of 8s. 11·32d. per ton of coal carbonized, making the net cost of coal delivered on the works 2s. 2·17d. per ton. During the year, 330 yards of 3-inch and 213 yards of 4-inch mains were laid. The interest and sinking fund charges absorb 1s. 10½d. per 1000 cubic feet of the price charged for gas to the consumers.

In the course of a general survey of the position, Mr. Blakey says that the year under review has been the most successful, both as regards expansion of business and financial results, since the Council purchased

the works. The former is due partly to the increased demand for gas from new properties, and partly to the increased number of gas cookers and boilers in use; and this growth in income has been aided by economies in working, improvements in manufacture, and better prices for residuals. The installation of a coke-conveying plant, on the telpher system, has enabled the Committee not only to save considerably in the cost of handling the coke, but to give the workmen much better conditions of employment. In addition to the advantages gained in the works, coke users find great benefit in taking their supplies of coke direct from the hoppers. When the additional plant for automatically removing the hot coke from the retort-house has been installed, the Council will have completed a system enabling the men to work under the best possible conditions. Having regard to the fact that the financial results have changed from a loss of 1·45d. per 1000 cubic feet for the year ended March 31, 1909, to a net profit of 4·06d., the question of a reduction in price becomes a matter for consideration. The Council will have to bear in mind the expenditure of £750 in completing the coke-conveying plant, and the almost certain advance in the price of coal during the present year. The coal strike put a severe strain upon the department; but fortunately the supply to all consumers was kept going. No advantage was taken of the scarcity of coal to advance the price of coke; and, under instructions from the Committee, the coke was sold in small quantities to domestic users at normal rates. With the growth of the district and the ever-increasing uses of gas, the Committee can look forward with confidence to the future; and notwithstanding the burden of a heavy capital expenditure, the Gas Department will increase in value as one of the most important public services.

At the monthly meeting of the Council last Thursday, the minutes of the Gas Committee which were adopted stated that the Committee were very pleased with the work of the department, and congratulated the Engineer on the record of the past year. Further, the Committee had agreed to recommend the Council to allow 2d. extra discount per 1000 cubic feet on all gas sold, as from July 1 next. An advance of £25 in Mr. Blakey's salary was agreed to.

Messrs. John Wright and Co. were recently instructed by the Wem (Salop) Gas Company to canvass their district; and they have secured orders for a large number of complete slot cooker, meter, and lighting installations. Similar work has been done for the Fairford (Gloucestershire) Gas Company; and a large number of applications have been received for complete installations.

At a meeting of the Heywood and Middleton Water Board last Thursday, it was reported that the deficiency on the past year's working was £10,759, compared with £10,772 last year, £10,820 for 1910, and £11,027 for 1909. The deficiency has to be made good by the ratepayers of Heywood and Middleton; and the Board decided to levy on the two Corporations precepts for £5447 and £5312 respectively. These sums represent a rate of about 1s. in the pound in each town.

MONTE VIDEO GAS COMPANY.

Large Increases in the Cooking, Geyser, and Industrial Load.

The Ordinary General Meeting of this Company was held on Thursday last, at Winchester House, Old Broad Street, E.C.—Mr. T. C. TATHAM presiding.

The SECRETARY (Mr. Henry Kearns) read the notice convening the meeting; and the Directors' report and the statement of accounts were taken as read.

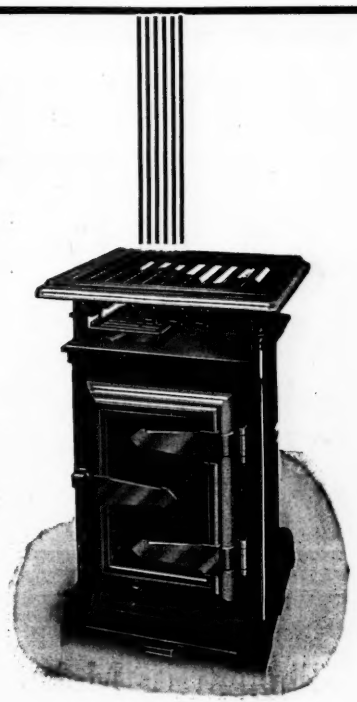
The CHAIRMAN, in moving their adoption, said, before proceeding to the business of the meeting, he desired to express, on behalf of the Board, the sorrow they felt at the death of their late colleague, Mr. Robert Morton. He was a Director of the Company for nearly 25 years, and before that was associated with the Company as Consulting Engineer. In addition to his technical ability, he had the advantage of knowing the works at Monte Video, because he had been there on the Company's behalf. He (the Chairman) was sure the shareholders would join with the Board in placing on record their appreciation of Mr. Morton's long and valuable services. In his place the Board had elected Mr. Frank Harding Jones, M.Inst.C.E., who was also a Director of the South Metropolitan Gas Company, and was associated with several other gas undertakings in the country. Turning to the balance-sheet, the Chairman referred to several of the items. Among them, he pointed out that the capital account, the reserve account, and the insurance fund were unchanged. To the reserve for renewals, £3000 had been transferred from the profits of the year; and the account was now raised to £17,500. The contingency account, however, showed a reduction of £474, which was due to the depreciation in the market value of the investments at Dec. 31 last. This seemed to be the general experience of those who had invested in high-class securities. Among his references to the other side of the account, the Chairman stated that £4844 had been written off for depreciation; and £2255 had been expended on new mains and meters. This brought up the total capital expenditure to £535,821, against the total capital receipts of £570,600. The general result of the examination of the balance-sheet showed that the Company's financial position continued to be strong—which, the Chairman remarked, was a necessary precaution in these uncertain times. Coming to the revenue account, he said the shareholders would see that the receipts from the gas department were within £23 of those of the previous year, while those from the dock and workshops were £1308 more. This total increase in receipts was, he thought, satisfactory, when they took into account that a much larger proportion of the gas sold was for cooking, geyser, and industrial purposes, all of which was supplied at a low price. This expansion in the sale of the cheaper gas was satisfactory, as about one-half of the output was being used in the day time—thus keeping the works constantly employed. This was in furtherance of their policy to endeavour to serve all the interests of the public, and

FAMILIARITY

Familiarity with the "Main" Cookers begets confidence in their merits. They represent the highest attained degree of workmanship and quality.

They appeal to the practical man because of their efficiency, the simplicity of their design, and the accessibility and strength of wearing parts.

While making more and more new friends every season, they retain their hold on the affections of old friends.



R. & A. MAIN, LIMITED,

Gothic Works, ANGEL ROAD, EDMONTON, LONDON, N.

London Show-Rooms: 25, PRINCES STREET, LONDON, W.

56, Broad Street, BIRMINGHAM; 13, Whitworth Street West, MANCHESTER; Gothic Ironworks, FALKIRK; 136, Renfield Street, GLASGOW; 83, Old Market Street, BRISTOL; 8, Exchange Place, Donegall Street, BELFAST; 333, Queen Street, MELBOURNE; and 12, Cunningham Lane, Pitt Street, SYDNEY, N.S.W.

place the business on as wide a basis as possible. For example, the sale of gas for cooking purposes increased by 40 per cent. during the year, while for geysers and industrial purposes the increase was 42 per cent. These two items were capable, the Board believed, of expansion; and now that the public in Monte Video were convinced of the cleanliness, the efficiency, the instant readiness, and the cheapness of cooking by gas, as well as its adaptability for other domestic and industrial operations, the Directors looked forward with some confidence to an increase under these heads in the future. Those shareholders who had been in the habit of attending the meetings would know that, when the Board commenced the gas-cooking propaganda they did not seem to be able to get the public to appreciate it. But it was gratifying to note that the increase had been fairly rapid during the last few years; and when once this kind of thing really got started and "caught on," there was hope there would be a good future for it. With regard to the expenditure, this had increased by £2362. The year had not been altogether a "bed of roses." They had had to face, as he predicted at the last meeting they would have to do, high freights throughout the year. The Directors, however, took advantage of any temporary drop in the freight; and this, aided by a coal contract fortunately made on favourable terms, had enabled them to close the year with a net reduction in revenue of only £1079. The expenditure was also affected by the serious general strike in Monte Video during the month of May, 1911, which not only reduced the revenue, but caused the Board difficulties in carrying out their operations, and thereby added to the expense. He desired to acknowledge the loyalty of their men to the Company. They could not really be said to have "struck," because most of them were practically compelled to stop work by reason of intimidation and fear, and only a few of them remained to carry on the work of the retort-house. With regard to the reconstruction of the retort-house (for which they had now reserved £17,500), this was so dependent on the South-Coast Embankment Scheme, that the Board had considered it would be good policy to defer the work until they knew more clearly what particular part, if any, of their property would be required for the embankment. By doing this, they were no doubt losing the advantage of the economy they hoped to gain in the cost of carbonization; but they did not consider themselves justified in spending so large an amount of the shareholders' money until they knew more clearly how they stood with regard to the scheme. Some differences of opinion had arisen in respect of the contract for the construction of the embankment; and for a short period—until the end of June, or thereabouts—the matter was in suspense. The recent national strike of coal miners in this country, of course, was fresh in the minds of those present. In anticipation of the strike, the Board shipped largely; and consequently the Company were not injuriously affected by the strike on this side. But on the arrival of the coal in Monte Video in February, they were met with a general strike of all the coal workmen and carters, by which the discharge of the coal was greatly delayed; and it was not until the early part of April that the last of the cargo was put into the Company's lighters. He mentioned this as showing some of the difficulties which these perpetual strikes imposed on a business such as theirs. Labour unrest, as it was called now, seemed general in Monte Video, as well as in this country, and was an evil which upset all calculations, and seriously increased expense. It also entailed hardship and loss upon their men, who had no complaint against the Company, and who would be willing to work if they were free to do so. The profit and loss account scarcely required comment. They closed the year with a balance of £31,462, including £12,337 brought into the account; and after payment of the dividend, the carry-forward was increased, by £158, to £12,495.

Mr. CHARLES HUNT seconded the motion.

Mr. T. WILKINS remarked that, having known Mr. Robert Morton for nearly forty years, and as a shareholder in this Company, he should like to endorse the Chairman's appreciation of their late friend.

There were speeches from various shareholders, mainly directed to the hope that there would soon be an increase in the dividend. The Directors were also congratulated upon putting a younger man upon the Board and an expert gas engineer (Mr. Frank Jones); and one shareholder, with a knowledge of Monte Video, expressed the opinion that one of the Directors should visit Monte Video.

The CHAIRMAN, in reply, said that since he had been in the chair, he had always held that he should be supported by the best of experts. He believed, in the case of a gas company, that to have an expert gas man on the Board was the right thing. As to the visit of a Director to Monte Video, some years ago he (the Chairman) went out; Mr. Morton also went out later; and four years ago, when Mr. Hunt was elected a Director, he paid the city a visit. Admittedly this was a great advantage. Although no Director went out last year, the Board had the advantage of having their General Manager home; and they met him in consultation over and over again. As to the dividend, there was nothing nearer to his wishes than that he should be able to come to the shareholders with a proposal for an increase of the dividend. Most of the shareholders knew they had very grave and difficult conditions in 1887, when they lost the whole of the public lighting, which gave them a revenue of £23,000 a year; and the Board had then great difficulty in maintaining the dividend. But he ventured to say the Company was now a better Company and in a strong position, than it had been in for many years.

The motion was unanimously carried.

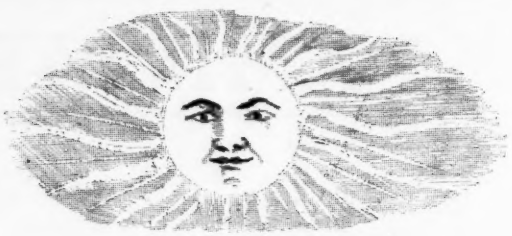
On the proposition of the CHAIRMAN, seconded by Mr. JOHN MEWS, a dividend (in addition to the interim payment) of 8s. per share, less income-tax, was declared, making 3½ per cent. for the year.

Moved by the CHAIRMAN, and seconded by Mr. MEWS, Mr. Frank H, Jones was re-elected a Director; as was also the Chairman, on the proposition of Mr. HUNT, seconded by Mr. MEWS.

The Auditors (Mr. George Sneath and Mr. Laurence E. Halsey, of Messrs. Price, Waterhouse, and Co.) were re-appointed.

Votes of thanks to the Chairman and Directors and to the officers and staffs at Monte Video and in London concluded the proceedings.

A NEW FRIEND WITH AN OLD FACE.



When people wanted a gas-heated Boiler, they have always asked for the "**SUN.**" Will they do so any more, now the "**SHADOW**" is coming?

A well-known firm, impressed by the persistent success of Wright's "**SUN,**" are about to bring out a Boiler on the "**SUN**" principle.

Though its Makers give it another name, people will call it

The "SHADOW."

The "**SHADOW**" wants a place in the "**SUN**"—but then, the "**SHADOW**" must always be "in the shade"!

CONGLETON CORPORATION GAS DEPARTMENT.

Annual Financial Statement.

The accounts of the Gas Department of the Congleton Corporation for the year ended the 31st of March show that, subject to audit, the receipts amounted to £10,012, compared with £9501 for the year 1910-11; the gross profit being £3364, against £3307—an increase of £57. Deducted from this amount is £1931 for interest, income-tax, depreciation, and redemption of loans, compared with £1860 before—an increase of £71—and £180 for a new exhauster and engine, fixed during the year, and paid for out of revenue. After adding £56 for bank interest, the net profit is £1309, compared with £1514—a decrease of £205, which is more than accounted for by the £180 spent on the new exhauster and engine and the increase of £71 on income-tax and depreciation, &c. The reserve fund of £500, as per resolution of the Council of Dec. 21, 1908, is now completed; and the unappropriated profit stands at £2623, compared with £2376 last year.

The manufacturing statement of the Gas Engineer and Manager (Mr. Joseph T. Broughton) shows that the quantity of coal carbonized was 5325 tons, and the gas production 63,204,700 cubic feet, or at the rate of 11,860 cubic feet per ton, of which 11,170 cubic feet were sold. The gas accounted for was 59,512,500 cubic feet; leaving 3,692,200 cubic feet, or 5·84 per cent., unaccounted for. With regard to residuals, 2510 tons of coke and breeze were sold, and 328 tons 10 cwt. of tar and 637 tons of ammoniacal liquor were produced.

DEFICITS ON SMALL ELECTRICITY UNDERTAKINGS.

Some Useful Statistics.

Aylesbury is considering the question of an electric lighting installation. In a recent issue of the "Bucks Herald," Mr. T. Field, a resident of Aylesbury, pointed to the profit made at Coventry by the electricity supply undertaking, without considering the fact that Coventry, with its magnificent cycle and motor works (large day customers of the Electricity Department), and Aylesbury are about as dissimilar in the characteristics that make an electricity concern pay as any two places well can be. Mr. T. E. Pye, the Engineer of the Chichester Gas Company, has replied to Mr. Field in a letter headed: "£17,000 a year Burden on the Rates." He supplies the following interesting statistics and information:

Such, I understand, is the tale of woe and the financial working result for the past year of the Woolwich electricity undertaking. A *deficit* of £17,000 in one year, and of another £12,000 in the previous year! But what has Woolwich to do with Aylesbury? Just about as much, neither more nor less, as Coventry. Neither Woolwich nor Coventry can be accepted in any way as a guide to Aylesbury. But the following towns, owning their own electricity undertakings, can be taken as a guide:

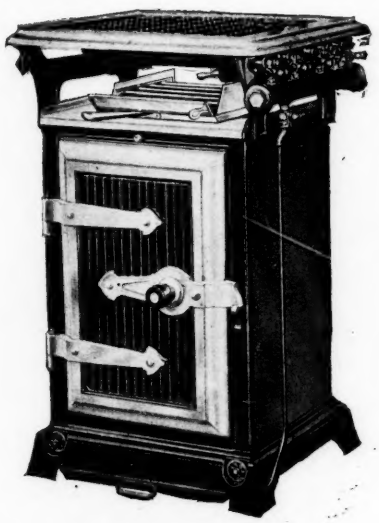
Name of Town.	Population.	Result of Working. Surplus. £	Deficit. £
Alloa	11,000 to 12,000	—	651
Bangor	12,000	—	346
Broughty Ferry	10,000 to 11,000	104	—
Buxton	12,000 to 13,000	—	512
Cleckheaton	13,000	—	87
Dorking	8,000	—	174
Aldrington	10,000 to 11,000	—	207
Elland	10,000 to 11,000	—	1077
Fareham	8,000 to 9,000	85	—
Felixstowe	7,000 to 8,000	—	40
Hebden Bridge	7,000 to 8,000	—	467
Heckmondwike	9,000 to 10,000	1354	—
Horsham	12,000 to 13,000	315	—
Llandudno	10,000	74	—
Monmouth	5,000 to 6,000	—	430
Morecambe	12,000 to 13,000	—	3053
Rhyl	9,000	—	923
St. Anne's-on-Sea	9,000 to 10,000	971	—
Whitby	11,000 to 12,000	—	1283
Northfleet	13,000	—	107

Some of these particulars are from the "Electrical Times" returns, but not all—including several of the worst cases. So far as I am aware, the returns of no one of the above-named undertakings include the provision of one penny for depreciation of plant. Four per cent. depreciation alone (an absurdly low figure, as every one of your business readers will appreciate) would, on the capital of the six undertakings showing a profit, convert their alleged surpluses into an aggregate deficit of £5857; and the deficits shown above would be *enormously* increased by a similar treatment of the accounts of the undertakings to which they relate.

The schedule as given above includes *every undertaking in the United Kingdom* (owned by local authority) serving a population of 13,000 and under as to which I can obtain the returns. The figures are given as they are given to me, and therefore accurately represent the actual position to-day of small town electricity enterprise. They are eloquent indeed of the risks the Aylesbury ratepayers are now invited to run.

In one of the towns above named, I have the information that, although the public lighting costs, by electricity, over £670 per annum, as compared with a little over £300 per annum previously paid for gas, there is a deficit of over £400 on the year's working; and this again without allowing for any depreciation.

The Finance Committee of the Bridlington Town Council are recommending the Council to purchase the undertaking of the Bridlington Gas Company, whose share and loan capital is £47,147.



THIRTY YEARS AGO

"Davis" Cookers gained the Highest Award, and were placed first in order of merit, at the two first important Gas Exhibitions ever held—the Smoke Abatement Exhibition, SOUTH KENSINGTON, 1882, and the International Exhibition, CRYSTAL PALACE, 1883.

TO-DAY we still hold the premier position with the "New Davis" Screwless Cooker, the "Long Life" Cooker which is a triumph as regards

MAINTENANCE.

The DAVIS Gas Stove Co Ltd. Luton

London Show-Rooms: 59, Queen Victoria St., E.C.

(Phone: 742 Bank.)

ENTERTAINMENT TO "GAS SUPPLY" STUDENTS.

Wrexham Gas Company and their Employees.

On the invitation of Mr. Joseph Braithwaite, the Engineer and Manager of the Wrexham Gas Company, the students of the "Gas Supply" class were a few days ago entertained at tea. In the unavoidable absence of Mr. Braithwaite, through ill-health, Mr. J. Oswell Bury, the Chairman of the Company, presided. At the close of the repast, Mr. Owen Evans, the Assistant-Manager, in proposing a hearty vote of thanks to Mr. Braithwaite for his hospitality, and to Mr. Bury for presiding, said this was the fourth year Mr. Braithwaite had entertained the class; and it was proof of the great interest he took in it and the employees generally. Mr. Evans also said they were grateful to Mr. Bury and his co-Directors for the consideration they showed for their employees, and especially in the work done by the students of the class. Mr. H. E. Crease seconded the vote of thanks, which was carried by acclamation. Mr. Bury, in responding, expressed his regret at the absence of Mr. Braithwaite. Referring to the crisis the country had passed through during the late coal strike, he said he and his co-Directors were pleased at the amicable relationship existing between them and the workmen of the Company. This he partly attributed to the co-partnership scheme, and also to the fair way in which the workmen were always met by the management if any little dispute occurred. Nothing gave the Directors more pleasure than to see the certificates and prizes which were from time to time gained by their employees at the continuation classes, and the results achieved amply repaid the expenditure incurred in providing the employees with opportunities for self-improvement. A vote of thanks was also accorded to Mr. Evans for his services as lecturer to the class; and he briefly acknowledged it.

EXHIBITIONS OF GAS APPLIANCES.

An effective and highly successful exhibition of gas appliances has just been held by the Weston-super-Mare Gas Company in the Assembly Rooms in the town. At the west end of the hall were three brilliantly illuminated stands, on which were displayed artistic gas-fittings in great variety, the majority of them connected with the pneumatic switch. Messrs. Wilsons and Mathiesons, Limited, had on view a large collection of gas cooking-stoves, gas-fires, water-heaters, &c. A working model of a gas-heated hot-water circulator showed how an entire house could be supplied. There was a fine display of gas-lamps for shop lighting; and the Voelker Company had an attractive stand on which their mantles were shown. A local ironmonger (Mr. Fred Thorn) had two stands—one presenting a full bath-room equipment; and the other having upon it a collection of cooking utensils suitable for use on gas-stoves. The opening ceremony was performed by Mrs. Smyth-Pigott (the Lady of the Manor), who was introduced by Mr. Ernest E. Baker, one of the Directors of the Company. In an interesting speech she expressed her pleasure in accepting the Company's invitation to inaugurate the exhibition. She heartily wished it success, and trusted prosperity might attend the enterprising Company who had promoted it. A cordial vote of thanks having been passed to Mrs. Smyth-Pigott, Miss Edith Sanderson proceeded to give an interesting cookery lecture and demonstration with a Wilson stove. These lectures were continued each afternoon and evening during the exhibition, the arrangements for which were under the direction of the Company's Engineer and Manager (Mr. J. H. Gray).

The Whitby Gas Company have just held an exhibition of gas appliances; the stoves shown being Messrs. John Wright and Co.'s "Eureka" type. The firm's "Sun" boiler, which can be used either independently or to supplement a coal range, was on view; and also their "Calefactor." In addition to these specialities, some very pretty designs in movable pendants, artistic shades, and a single-light locking pendant of a very efficient pattern, were shown. Cookery demonstrations were given by Mrs. E. E. Middleton.

NOTES FROM SCOTLAND.

From Our Own Correspondents.

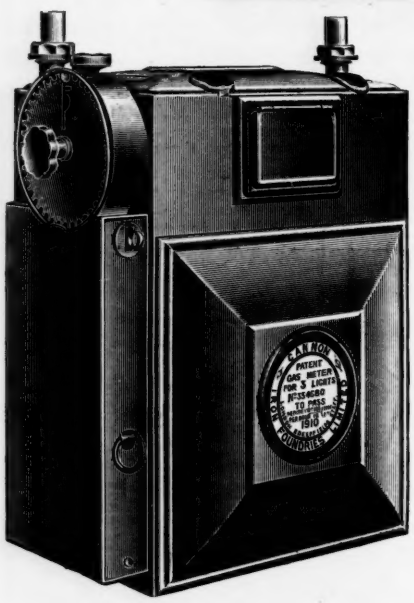
Saturday.

Edinburgh.

A very gratifying response has been made by the general public to the offer of the Edinburgh and Leith Corporations' Gas Commissioners to fit up gas-cookers free of charge to approved householders. The orders are being rapidly overtaken; and to facilitate the work of putting them in, the city has been divided into districts. A report on the subject is to be submitted by the Engineer and Manager (Mr. A. Masterton) at an early meeting of the Gas Commissioners. The "forward" policy of the Commissioners has been splendidly justified by results.

There has been instituted in the Court of Session an action by the Clydebank and District Water Trustees against the Fidelity and Deposit Company of Maryland, of Palmerston House, Old Broad Street, London, for the recovery of £5000. It is stated by the pursuers that during February, 1909, they entered into a contract with the Columbian Fire-Proofing Company, Limited, of 37, King William Street, London, for the construction of a line of pipes, 9½ miles in length, from a point near Burncocks to their then existing water-filters at Cachno Lodge. In the contract it was provided that the Company should find surety to the extent of £5000; and the defenders issued a policy in favour of the pursuers for £5000. Work was proceeded with until August, 1909, when, under the conditions of the contract, operations were suspended for the winter. On Jan. 20, 1910, the pursuers received a letter from the Contractors stating that Mr. Justice Warrington had appointed a Receiver and Manager for the Company. Later on, the

The "CANNON" Prepayment



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NEARLY 80 YEARS' EXPERIENCE

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pursuers wrote to the defenders informing them that they were without any indication as to whether the Receiver or Liquidator intended to complete the contract or not, and calling upon the defenders to implement their obligations under the policy. In consequence of neither the Receiver or Liquidator nor the Contractors having done anything, the pursuers themselves had to undertake the completion of the contract, and expended a sum of £10,240. The total cost in connection with the contract was £24,407; being £6259 in excess of the agreed cost. The defenders plead that the arguments of the pursuers are irrelevant, and that the pursuers failed to fulfil the conditions incumbent upon them under the contract bond. They also aver that the pursuers, having altered the terms of their agreement with the Contractors without the consent of the defenders, the contract bond was voided. It was the duty of the pursuers to conform to the conditions of the contract bond, to see that the Contractors duly implemented their contract, and to timeously notify the defenders. They allege that the pursuers failed in their duty, and, contrary to the provisions of the minute of agreement, they overpaid the Contractors to the extent of £5197. The record was closed by Lord Dewar, and the case was sent to the Procedure Roll.

Buckie.—The report of the Directors of the Buckie Gas Company for the year to April 15 shows that the profit for the twelve months amounts to £500. A dividend of 5 per cent. on the cumulative preference shares for the year is recommended, and at the rate of 6 per cent. on the ordinary shares, both less income-tax. The Directors also recommend that £50 be written off buildings and retort-bench, £55 off gas appliances, £45 off pipes, and £50 off meters—in all, £200, which, with the dividend, will absorb £455, to be carried to profit and loss account, subject to the Directors' remuneration. The Directors report that there has been a considerable increase in the consumption of gas, and that there are over 1000 meters in operation. The plant at the works continues to run satisfactorily, and is giving good results.

Crieff.—At a special meeting of the Town Council held on Monday night, it was resolved to accept the offer of Messrs. Callender and Co. for the repair of the reservoir on the Knock at a cost of £555, and also to purchase meters for the detection of waste of water at an expenditure of £286.

Cullen.—At a special meeting of the shareholders of the Cullen Gaslight Company on Friday, a resolution was passed agreeing to sell the undertaking to Mr. J. W. Napier, of Alloa, for the sum of £1300.

Cumnock.—At a meeting of the Town Council, it was agreed to increase the storage capacity of the water supply for the burgh by at least 3,000,000 gallons.

Dundee.—Still another falls to be added to Dundee's list of suicides by gas poisoning; the victim on this occasion being a labourer named Anderson. Early on Sunday morning he was found dead on the floor, with his head covered with an overcoat. Beside him was a gas cooking-ring, the rubber tube of which led beneath the overcoat.

Kilmarnock.—The Bill which has been introduced into Parliament to confirm a Provisional Order relating to the Kilmarnock gas undertaking provides for the borrowing of £10,000 for enlarging and improving the works.

Linlithgow.—Some alarm was caused on Sunday in a villa situated on the north side of Linlithgow by an explosion of gas. It appears that a gas-cooker had just been lighted. The servants had gone into an adjoining pantry when the explosion took place, wrecking the cooker, and blowing out the windows of the kitchen, as well as damaging the ceiling. Fortunately no one was injured.

Stonehaven.—Presiding at the annual meeting of the Gas Company on Monday, Mr. George Gregory, in moving the adoption of the report, which recommended the usual dividend of 3s. 6d. per share, said the gas manufactured during the year had been increased by 1,679,000 feet. The amount received for gas sold was £2977—an increase of £30, notwithstanding that there had been a reduction of 3d. in the price. It was proposed during the coming year to erect a holder costing £2000. A resolution that the Company should be registered under the Companies Act was agreed to.

CURRENT SALES OF GAS PRODUCTS.

Sulphate of Ammonia. LIVERPOOL, *May* 24.

Demand for prompt delivery having been well sustained all through the week, and available supplies not being very plentiful, there has been a further hardening in prices; and the closing quotations are £14 15s. per ton f.o.b. Hull, and £14 17s. 6d. to £14 18s. 9d. per ton f.o.b. Liverpool and Leith. Although there has been a fair amount of inquiry for delivery ahead, buyers have not been very keen, and no important business has transpired. Makers continue to quote £14 10s. per ton f.o.b. for July-December, and for the first half of next year.

Nitrate of Soda.

The market for this article is rather quieter, and 11s. per cwt. is now the value of 95 per cent., while 11s. 1½d. would be accepted for refined quality.

LONDON, *May* 24.

Tar Products.

The markets for tar products remain firm. The demand for pitch is very good and continues; and the inquiry is regular for both prompt and forward delivery. Makers are firm in their ideas of price. Benzols are steady, and the inquiry is good; but transactions are difficult to negotiate owing to consumers' ideas being lower than the manufacturers'. Solvent and heavy naphthas are in good demand, and prices remain firm. Creosote maintains its price, and there is a steady inquiry both for prompt and forward delivery. Crude carbolic acid continues about the same. One or two parcels changed hands for near delivery at the equivalent of to-day's quotation; but business is difficult to negotiate for forward.

The average values during the week were: Tar, 28s. to 32s. *ex* works. Pitch, London, 53s. to 54s. 6d.; east coast, 52s. 6d. to 54s.; west coast, Clyde 53s. to 54s. 6d., Manchester 51s. 6d. to 53s. 6d., Liverpool 52s. 6d. to 53s. 6d. Benzol, 90 per cent., naked, London, 11d.

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of advantage from the many found in our Slot Meters are:

1st.—They are Fraud Proof, and cannot be tampered with through the Slot.

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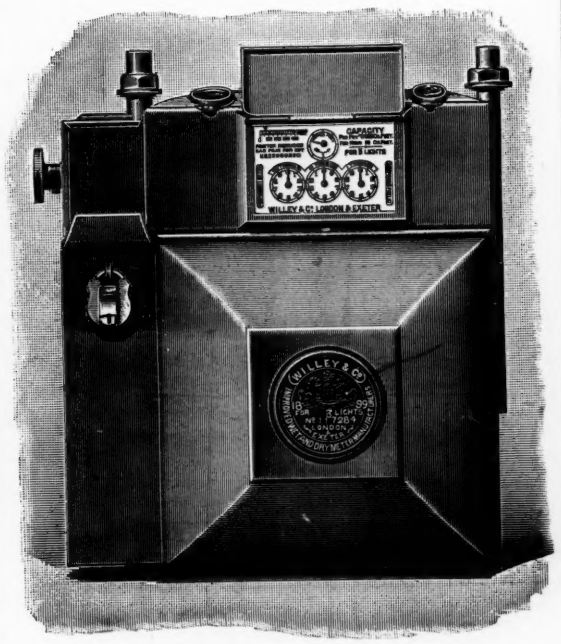

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AGENTS FOR SCOTLAND:
D. M. NELSON & CO., 53, WATERLOO STREET, GLASGOW.

to 11½d.; North, 11d.; 50-90 per cent., naked, London, 10d.; North, 9½d. Toluol, naked, London, 10d. to 10½d.; North, 9½d. to 10d. Crude naphtha, in bulk, London, 4½d. to 5d.; North, 3⅞d. to 4½d. Solvent naphtha, naked, London, 1s. 0½d. to 1s. 1d. f.o.b.; North, 11d. to 11½d. f.o.b. Heavy naphtha, naked, London, 11d. to 1s. f.o.b.; North, 10d. to 10½d. f.o.b. Creosote, in bulk, London, 2⅝d. to 3⅛d.; North, salty, 2½d. to 2⅝d.; liquid, 2⅝d. to 2¾d. Heavy oils, in bulk, 3¼d. to 3⅜d. Carbolic acid, casks included, 60 per cent., east and west coast, 2s. 4d. to 2s. 5d. Naphthalene, £4 10s. to £9; salts, 45s., bags included. Anthracene, "A" quality, 1½d. to 1¾d. per unit, packages included and delivered.

Sulphate of Ammonia.

Although there is not much business doing, prices remain steady, and tender parcels appear to be fetching very good value considering the state of the market. Beckton to-day is quoted £14 5s. Outside London makes are £13 18s. 9d.; Leith, £15; Middlesbrough, £14 17s. 6d.; Hull, £14 17s. 6d.; Liverpool, £14 18s. 9d. The strike in London is bound to have an effect on other ports, as no shipments will be made from here while the strike lasts. Makers are behind in their deliveries at several ports owing to the recent coal strike, and report that it will be several weeks before they are able to overtake arrears.

COAL TRADE REPORTS.

Northern Coal Trade.

The coal trade is steady. The holidays allow steamers to arrive in more adequate numbers, and will also lessen the supply of coal; so that the prices are firmer. For steam coals, best Northumbrians are from 13s. 9d. to 14s. per ton f.o.b.; and second-class steams are 12s. to 13s. For steam smalls the price is steady at from 9s. to 9s. 6d. per ton f.o.b. The production at the collieries has been heavy in the last few days, but will be less for a week or so. In the gas coal trade, the demand is good for this season, and prices are steady generally. Best Durham gas coals are from 14s. per ton f.o.b.; second-class kinds are about 12s. 3d. For "Wear" specials, the quotation is from 15s. 6d. per ton f.o.b. A number of gas coal contracts are now in treaty, and will be decided in a few days. One large supply for St. Petersburg is fixed at 21s. 9d. for best Durhams, delivered—a sharp advance due to the higher prices of the coal, and also to the enhanced freights. Prices for Turin, for Rouen, and for Stockholm are likely to be similarly raised; the same two factors influencing the values. Dearer coal is certain now that the minima in wages are decided; and it seems pretty clear that freights will be high for this year at least. Coke is steady. The output of gas coke is limited now, and the price is 15s. per ton at the Newcastle Gas-Works.

Scotch Coal Trade.

During the week the Scotch coal trade has been somewhat unsettled, and the conditions generally were unsatisfactory. On Friday, the quotations in Glasgow, f.o.b., were: Steam coal, 10s. 6d. to 11s. 6d.; splint, 11s. 6d. to 12s. 6d.; ell, 10s. 6d. to 11s.; trebles, 11s. to 11s. 6d.; doubles, 11s. to 11s. 6d.; and singles, 11s. 6d. to 12s.

A Bust of Murdoch.—The District Council of Redruth have been offered by Mr. Murdoch, of Camborne, a bust of William Murdoch, who lived at Redruth at the time he made his first experiments in gas lighting. The Council have accepted the gift, and have decided that the bust (which is said to be a copy of the one at Glasgow) shall be placed in the Free Library until a decision has been arrived at respecting a permanent situation for it. Reference was made at the Council meeting to the fame which had come to Redruth through Murdoch's association with the place.

GAS COMPANIES' STOCK AND SHARE LIST.

The short week which closed with the inception of the Whitsuntide recess was a gloomy one for the Stock Exchange. The uncertainties and anxieties regarding a too-widely extended speculative position which were keen enough the week before had now become intensified. Three more failures in Dublin indicated a degree of recklessness which might have serious effects here. Then the industrial unrest culminated in an actual declaration of a strike, the extent of which it is quite impossible to foresee. Coupling dearer money on to these, it is no wonder that the Stock Markets have had a gloomy time. The opening day was dull and weak; prices drooping almost everywhere. Government issues gave way, Consols receding ⅛. Rails were quite out of favour, and lower all round. Only Americans picked up. Tuesday was much depressed and sensitive, though the worst seemed over before the finish. Gilt-edged were weaker, Consols lost another ⅛ for money and account; while Rails continued to fall. On Wednesday, a turn in the Money Market helped Consols up ⅛ for account; but the rest generally were in poor case—weak speculative accounts causing much uneasiness. This condition of things ruled through Thursday. Realizations proceeded freely to avoid uncertain positions, and prices shrank accordingly. Consols lost ⅛ for money and account, Rails went from bad to worse, and there was scarcely a firm spot anywhere. Friday was a poor day, having to encounter the actuality of the strike, and prices generally were easier accordingly. Consols closed at 77⅜ to 77⅝—a loss of ⅜ in the week. In the Money Market, there was a good demand, and rates stiffened, and, after a slight recoil, closed firm. Business in the Gas Market was quite on a fair average for a broken week, and the tendency was entirely satisfactory, though few actual changes in quotation were recorded. A noteworthy incident (though outside our exact ambit), illustrating the strong hold of gas upon the public as an investment, was furnished last week by the subscription eighty-two times over of a Municipal loan for gas extensions and improvements in Paris. In Gaslight and Coke affairs, the ordinary was brisk and firm; all transactions being within the limits of 104½ and 105¼. Hardly anything was done in the secured issues; but the maximum realized 85¼, preference 102½, and the debenture from 79¼ to 80. South Metropolitan was moderately dealt in at 119¾ to 121½. In Commercials, the 4 per cent. made 109, the 3½ per cent. 104, and the debenture 75½. Among the Suburban and Provincial group, Alliance and Dublin changed hands at 76, Brentford new at 199 (a rise of 1), Brighton original at 215, ditto ordinary at 158½, and South Suburban at 124. Ilford "A and C" is quoted at 152-154; but a new issue of "C," offered at the Mart, fetched from 161 to 161¼. In the Continental companies, Imperial marked from 186 special to 188, Union from 84 special to 85½, ditto preference 136½, European 19¾ and 20¼, Tuscan 8¾, and ditto debenture 100½. Among the undertakings of the remoter world, Bombay made 6⅜, Cape Town preference 4⅛, Monte Video 12¼,, Primitiva 7⅛ and 7¼, and ditto preference from 5¼ to 5⅜.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
1,551,868	Stk.	Apl. 12	5	Alliance & Dublin Ord.	77—80	..	6 5 0
374,000	Stk.	Jan. 12	4	Do. 4 p.c. Deb.	91—93	..	4 6 0
250,000	5	Apl. 12	7½	Bombay, Ltd.	6—6⅜	..	5 15 5
50,000	10	Feb. 29	15	Bourne-mouth Gas & Water Pref. 6 p.c.	28⅜—29½	..	5 1 8
332,000	10	"	7	Brentford Consolidated	16—16½	..	4 4 10
75,000	10	"	6	Do. New	14⅜—14⅝	+⅛	4 1 4
380,000	Stk.	"	13	Do. 5 p.c. Pref.	258—263	..	4 18 10
380,000	"	"	10	Do. 4 p.c. Deb.	196—201	+1	4 19 6
50,000	"	"	5	Brighton & Hove Orig.	118—120	..	4 3 4
206,250	"	Dec. 14	4	Do. A Ord. Stk.	97—99	..	4 0 10
219,055	Stk.	Feb. 29	11	Do. A Ord. Stk.	215—220	..	5 0 0
244,200	"	"	8	British	156—159	..	5 0 8
490,000	20	Mar. 28	12½	Do. 4 p.c. Deb. Stk.	44⅛—45½	..	5 9 11
120,000	Stk.	Dec. 29	4	Bromley, A 5 p.c.	93—95	..	4 4 3
109,000	"	Feb. 15	6	Do. B 3½ p.c.	128—133	..	4 10 3
165,700	"	"	4½	Do. C 5 p.c.	98—101	..	4 9 1
82,278	"	"	5½	Buenos Ayres 4 p.c. Deb.	117—120	..	4 11 8
55,000	"	Dec. 29	3½	Cape Town & Dis., Ltd.	80—82	..	4 5 4
250,000	Stk.		4	Do. 4½ p.c. Pref.	95—97	..	4 2 6
100,000	10	"	—	Do. 4½ p.c. Deb. Stk.	2—3	..	—
100,000	10	—	—	Chester 5 p.c. Ord.	4—5	..	—
100,000	Stk.	Dec. 29	4½	Commercial 4 p.c. Stk.	76—80	..	5 12 6
157,150	Stk.	Feb. 15	5	Do. 3½ p.c. do.	110—112	..	4 9 3
1,513,280	Stk.	Feb. 29	5/9/4	Do. 3 p.c. Deb. Stk.	108—110	..	4 19 4
560,000	"	"	5⅓	Continental Union, Ltd.	103—105	..	5 1 6
475,000	"	Dec. 14	3	Do.	75—77	..	3 17 11
800,000	Stk.	"	4	Do. 7 p.c. Pref.	83—86	..	4 13 0
200,000	"	"	7	Derby Con. Stk.	136—138	..	5 1 5
492,270	Stk.	—	5½	Do. Deb. Stk.	132—134	..	4 8 9
55,000	"	—	4	European, Ltd.	104—105	..	3 16 2
840,150	10	Jan. 31	10	Gas-light & Coke 4 p.c. Ord.	19½—20⅝	..	4 17 7
16,160,600	Stk.	Feb. 15	4/14/8		104½—105⅝	..	4 9 9
2,600,000	"	"	3⅓		84⅛—86½	..	4 0 11
4,062,235	"	"	4		102—104	..	3 16 11
4,531,705	"	Dec. 14	3	Coke 3 p.c. Con. Deb.	78—80	..	3 15 0
258,740	Stk.	Mar. 14	5	Hastings & St. L. 3½ p.c.	93—95	..	5 5 3
82,500	"	"	6⅓	Do. do. 5 p.c.	—	..	—
70,000	10	Apl. 26	11	Hongkong & China, Ltd.	16⅛—17	..	6 9 5
131,000	Stk.	Mar. 14	7⅓	Ilford A and C	152—154	..	4 17 5
65,780	"	"	6	Do. B	123—125	..	4 16 0
65,500	"	Dec. 29	4	Do. 4 p.c. Deb.	93—95	..	4 4 3
4,940,000	Stk.	May 15	9	Imperial Continental	186—189*	..	4 15 3
1,235,000	Stk.	Feb. 15	3⅓	Do. 3½ p.c. Deb. Red.	88—90	..	3 17 9
200,242	Stk.	Mar. 14	6	Lea Bridge Ord. 5 p.c.	125—129	..	4 13 0
561,000	Stk.	Feb. 29	10	Liverpool United A.	219⅛—221½	..	4 10 3
718,100	"	"	7	Do. B.	159—161	..	4 6 11
306,083	"	Dec. 29	4	Do. Deb. Stk.	100—102	..	3 18 5
75,000	5	Dec. 14	6	Malta & Mediterranean	4⅜—5	..	6 0 0
560,000	100	Apl. 1	5	Met. of 5 p.c. Deb.	100—102	..	4 18 0
250,000	100	"	4½	Melbourne 4½ p.c. Deb.	101—103	..	4 7 5
541,920	20	Nov. 10	3½	Monte Video, Ltd.	12—12½	..	5 12 0
1,775,892	Stk.	Feb. 15	4⅜	Newc'tle&G'tesh'd Con.	99—101	..	4 6 8
529,705	Stk.	Dec. 29	3½	Do. 3½ p.c. Deb.	86—88	..	3 19 7
55,940	10	Feb. 29	7/7/0	North Middlesex 7 p.c.	14—15	..	4 18 0
300,000	Stk.	May 15	8	Oriental, Ltd.	134—136*	..	5 17 8
60,000	5	Mar. 14	8	Ottoman, Ltd.	7—7½	..	5 6 8
31,800	53	Feb. 29	13	Portsea Island A	137—140	..	4 18 4
60,000	50	"	13	Do. B	130—133	..	4 17 9
100,000	50	"	12	Do. C	127—130	..	4 12 4
398,490	5	May 15	8	Primitiva Ord.	6⅞—7⅛*	—¼	5 12 3
796,980	5	Dec. 29	5	Do. 5 p.c. Pref.	5¼—5½	..	4 10 11
488,900	100	Dec. 1	4	Do. 4 p.c. Deb.	97—99	..	4 0 10
312,650	Stk.	Dec. 29	4	River Plate 4 p.c. Deb.	95—97	..	4 2 6
250,000	5	Apl. 12	12	San Paulo, Ltd.	11¼—11⅜	..	5 2 2
115,000	10	"	6	Do. 6 p.c. Pref.	11⅝—12¼	..	4 18 0
125,000	50	Jan. 2	5	Do. 5 p.c. Deb.	50—51	..	4 18 0
135,000	Stk.	Mar. 14	10	Sheffield A	235—237	..	4 4 5
209,984	"	"	10	Do. B	234—236	..	4 4 9
523,500	"	"	10	Do. C	234—236	..	4 4 9
90,000	10	Sept. 28	7½	South African	8—9	..	8 6 8
6,429,895	Stk.	Feb. 15	5/9/4	South Met., 4 p.c. Ord.	119—121	—½	4 10 6
1,895,445	"	Jan. 12	3	Do. 3 p.c. Deb.	78—80	..	3 15 0
209,820	Stk.	Feb. 29	8½	South Shields Con. Stk.	156—158	..	5 7 7
605,000	Stk.	Feb. 15	5/16/8	S'th Suburb'n Ord. 5 p.c.	122—124	..	4 14 0
60,000	"	"	5	Do. 5 p.c. Pref.	117—120	..	4 3 4
117,058	"	Jan. 12	5	Do. 5 p.c. Deb. Stk.	119—121	..	4 2 8
502,310	Stk.	May 15	5	Southampton Ord.	105—107*	..	4 13 6
120,000	Stk.	Feb. 15	7⅛	Tottenham A 5 p.c. and B 3½ p.c.	144—147	..	4 17 0
483,940	"	"	5⅝		114—116	..	4 17 0
149,470	"	Dec. 29	4	Edmonton 4 p.c. Deb.	96—98	..	4 1 8
182,380	10	"	5	Tuscan, Ltd.	8⅝—8⅞	..	5 12 8
149,900	10	Jan. 2	5	Do. 5 p.c. Deb. Red.	99—101	..	4 19 0
236,476	Stk.	Feb. 29	5	Tynemouth, 5 p.c. max.	112—114	..	4 7 8
255,636	Stk.	"	6⅝	Wands-worth B 3½ p.c. 3 p.c. Deb. Stk.	141—144	..	4 15 6
85,766	"	Dec. 29	3		71½—73½	..	4 1 8

Prices Marked * are "Ex Div."

The London County Council propose to seek legislative sanction to enable authorities to fix street-lamps to any buildings—a power similar to that possessed by the Corporation of London.

The Metropolitan Water Board officials have just made an extraordinary discovery. It was recently found that a 36-inch water-main at Hampton was showing signs of becoming choked. It was opened, and 90 tons of freshwater mussels were taken out of a quarter of a mile of the main. The mussels were so tightly massed that the bore was reduced from 36 inches to 9 inches.

The Liquidator of the Non-Explosive Gas Company, Limited (Mr. C. M. C. Hughes), has given notice that a meeting of creditors of the Company will be held next Tuesday.

The Bristol Water-Works Company are about to increase their capital by the issue of £15,000 of 7 per cent. maximum consolidated ordinary stock in lots of £100, at the reserve price of £134 per £100; and from an announcement which appears elsewhere it will be seen that the stock will be offered for sale by Messrs. John E. Pritchard and Co. at the Bank Auction Mart, Bristol, on the 6th prox.

WANTED, FOR SALE, CONTRACTS, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Appointments, &c., Vacant.

ENGINEER (AUSTRALIA). No. 5578.
ASSISTANT WORKS MANAGER. No. 5569.
CANVASSER. No. 5580.
GENERAL FOREMAN. No. 5575.
RENTAL COLLECTOR, CLERK, &c. No. 5579.

Appointments, &c., Wanted.

ENGINEER, MANAGER, AND SECRETARY. F. Smallbone, Woodford Green.
SULPHATE PLANT MAKER AND REPAIRER. Leadburner. 15, Martin Street, Stratford.

Representation (Central Europe) Wanted.

SEWAGE CLARIFICATION. M.K. 5615, bef. Rudolf Mosse, Munich.

Business for Disposal (Lighting).

MOFFAT'S LIMITED. By Auction, June 11.

Plant, &c. (Second-Hand), for Sale.

LAMP COLUMNS AND LANTERNS. Barnsley Gas Company.
PURIFIERS, &c. Cannock, &c., Gas Company.
PURIFIERS, STATION METERS, &c. Brighouse Corporation.
PURIFIERS, WASHER AND ENGINE, &c., AND TOWER SCRUBBER. Cambridge Gas Company.
RETORT BENCHES, CONDENSERS, SCRUBBER, ENGINE AND EXHAUSTERS, PUMPS, PURIFIERS, HOLDERS, MAINS, &c. Great Western Railway Company. Tenders by July 11.
VALVES (FOUR-WAY). Cowes Gas Department.

Patent Licence, &c.

CLEANING PIPES, &c.; COKE OVEN BURNERS; AND APPARATUS FOR CHARGING, DISCHARGING, COKE OVENS, &c. Dicker, Pollak, and Derriman, Furnival Street, E.C.
WASHING AND COOLING GAS. Cruikshank and Fairweather, 66, Chancery Lane, W.C.

Meetings.

INSTITUTION OF GAS ENGINEERS. Royal United Service Institution, June 11, 12, and 13. 10.30 o'clock.
MALTA AND MEDITERRANEAN GAS COMPANY, 59 and 60, Gracechurch Street, E.C., June 11. Twelve o'clock.

Stocks and Shares for Sale.

ASCOT GAS AND ELECTRICITY COMPANY. London Mart. June 4.
BARNET GAS AND WATER CO. London Mart. June 4.
BRISTOL WATER COMPANY. Bank Auction Mart, Bristol. June 6.
BRIXHAM GAS COMPANY. London Mart. June 4.
BROMLEY AND CRAYS GAS CO. London Mart. June 4.
CROYDON GAS COMPANY. London Mart. June 4.
GRAYS AND TILBURY GAS COMPANY. June 18.
HUNGERFORD GAS COMPANY. London Mart. June 4.
MITCHAM & WIMBLEDON GAS CO. London Mart. June 4.
NEWPORT (MON.) GAS COMPANY. By Tender. June 14.
SOHAM GAS COMPANY. London Mart. June 4.
SOUTHGATE AND DISTRICT GAS COMPANY. London Mart. June 18.
SOUTH-WEST SUBURBAN WATER COMPANY. London Mart. June 18.
WHITCHURCH GAS COMPANY. London Mart. June 4.
YARMOUTH WATER COMPANY. London Mart. June 18.

TENDERS FOR

Coal and Cannel.

BARROW-IN-FURNESS CORPORATION. Tenders by June 6.
CARLISLE GAS DEPARTMENT. Tenders by June 5.
CHELMSFORD GASLIGHT AND COKE COMPANY. Tenders by June 5.
ELSECAR, WENTWORTH, AND HOYLAND GAS COMPANY. Tenders by June 12.
FORFAR GAS CORPORATION. Tenders by June 12.
NEWPORT (FIFE) GAS DEPARTMENT. Tenders by June 5.
PETERBOROUGH GAS COMPANY. Tenders by June 10.
PONTYPRIDD URBAN DISTRICT COUNCIL. Tenders by June 10.
SPALDING GAS DEPARTMENT. Tenders by June 10.
SUTTON, REIGATE, AND NEWHAVEN GAS COMPANIES. Tenders by June 1.
SUTTON-IN-ASHFIELD GAS DEPARTMENT. Tenders by June 4.

Coke.

SUTTON-IN-ASHFIELD GAS DEPARTMENT. Tenders by June 4.

General Stores (Sulphuric Acid, Lime, &c.).

FORFAR GAS CORPORATION. Tenders by June 12.
LOUGHBOROUGH GAS DEPARTMENT.

Lanterns and Burners, &c.

BANGOR (CO. DOWN) URBAN DISTRICT COUNCIL. Tenders by June 11.

Meters.

FORFAR GAS CORPORATION. Tenders by June 12.

Pipes, Fittings, &c.

FORFAR GAS CORPORATION. Tenders by June 12.

Residual Products.

FORFAR CORPORATION. Tenders by June 12.

Roof, &c.

COVENTRY GAS DEPARTMENT. Tenders by June 17.

Tar and Liquor (*see also* Residual Products).

BARNSLEY GAS COMPANY. Tenders by June 7.
DENTON GAS DEPARTMENT. Tenders by June 4.
GOOLE URBAN DISTRICT GAS DEPARTMENT. Tenders by June 12.
HOYLAKE AND WEST KIRBY GAS AND WATER COMPANY, Tenders by June 13.
LOUGHBOROUGH GAS DEPARTMENT. Tenders by June 7.
OLDHAM GAS DEPARTMENT. Tenders by June 18.
SUTTON-IN-ASHFIELD GAS DEPARTMENT. Tenders by June 4.

NOTICES TO CORRESPONDENTS, ADVERTISERS, AND SUBSCRIBERS.

No notice can be taken of anonymous communications. Whatever is intended for insertion in the "JOURNAL" must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office NOT LATER than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or stoppages of, PERMANENT ADVERTISEMENTS should be received by the FIRST POST on SATURDAY.

Wanted, For Sale, and Tender Advertisements, Six Lines and under, 3s.; each additional Line, 6d.

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All Communications, Remittances, &c., to be addressed to WALTER KING, 11, BOLT COURT, FLEET STREET, LONDON, E.C.
Telegrams: "GASKING, LONDON." Telephone: P.O. 1571a Central.

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"VOLCANIC" FIRE CEMENT.
Resists 4500° Fahr. Best for GAS-WORKS.
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THE very best Patent Grids for Holding Oxide Lightly.
See Illustrated Advertisement, April 2, p. 7.

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Recording Hydraulic Pressure Gauges.
Recording Water Level Gauges.
Recording Thermometers.
Indicating Electric Pyrometers.
Recording Electric Pyrometers.
Recording Milli Voltmeters for stray currents in gas-mains.
Long Distance Recording Tachometers, &c., &c.

TAR WANTED.

THOMAS HORROCKS & SONS, LTD.,

Albert Chemical Works, BRADFORD, MANCHESTER.

Pitch, Creosote, Brick and Fuel Oils, Benzol, Solvent Naphtha, Carbolic, Sulphate of Ammonia.

R. & G. HISLOP,

GAS ENGINEERS, RETORT BUILDERS, CONTRACTORS, &c.

RETORT SETTINGS, COAL TESTING PLANT, BOILER FIRING.

Communications should be addressed to Underwood House, PAISLEY.

D. ANDERSON AND COMPANY, GAS LIGHTING ENGINEERS AND CONTRACTORS,

18 & 20, FARRINGDON ROAD, LONDON, E.C.

Telegrams: "Dacolight London." Telephone: 2336 Holborn.

SULPHURIC ACID — Specially prepared for Sulphate of AMMONIA and BENZOL Recovery Plants. John Nicholson & Sons, Ltd., Hunslet Chemical Works, Leeds. Tele.: "Nicholson, Leeds." Telephone: (Two lines), Nos. 2420 and 2421.

GAS PLANT for Sale—We can always offer NEW and SECOND-HAND GAS APPARATUS, including Retorts and Fittings, Condensers, Exhausters, Scrubbers, Washers, Purifiers, Gasholders, Tanks, Valves, Connections, &c. Also a few COMPLETE WORKS. Compare Prices and Particulars before ordering elsewhere.
Firth Blakeley, Sons, and Company, Limited, Church Fenton, near Leeds.

AMMONIA. Consumers in any form are invited to correspond with Chance and Hunt, Ltd., Chemical Manufacturers, Oldbury, Worcs.

FOR Instructions on Polishing and Cleaning Gas-Cookers and Gas-Fittings, read Canning Handbook on Polishing, Electro-Plating, and Lacquering. Fully illustrated. Price 2s. 3d., post free; abroad, 2s. 6d.
W. Canning and Co., Birmingham, and 18 to 20, St. John's Square, Clerkenwell, London, E.C.

SULPHURIC ACID for Sale, specially suitable for making Sulphate of Ammonia.
Brotherton and Co., Ltd., Chemical Manufacturers. Works: Birmingham, Leeds, Sunderland, and Wakefield.

"GUIDE to Patents, Trade Marks and DESIGNS." (1912. 5th Edition). Contains concise information on British, Colonial, and Foreign Patents, &c. All Inventors and those interested should send for free copy to J. S. Withers & Spooner, Chartered Patent Agents, 323, High Holborn, London. 'Phone.: 480 Holborn. Telegrams: "Improvably, London." Established 28 years.

AMMONIA Waste Liquor Disposal. Purification Plant.
Results Guaranteed. No Working Costs.
John Radcliffe and Co., Chemists and Engineers, Palace Chambers, Westminster, S.W.

TO GAS AND WATER OFFICIALS.

BEFORE Purchasing your 1912 Cycle, kindly send post-card for our CATALOGUE, Cash or gradual Payments. Speciality, Slot-Meter Copper Collector. Melrose Cycle Co., Coventry.

THE

Institution

OF

Gas Engineers.

President:
ROBT. G. SHADBOLT, Esq.

THE

ANNUAL GENERAL MEETING

WILL BE HELD ON

TUESDAY, WEDNESDAY, and THURSDAY,
11th 12th and 13th JUNE,

AT THE

ROYAL UNITED SERVICE INSTITUTION,
WHITEHALL, LONDON.

THE PROCEEDINGS WILL COMMENCE AT 10.30 A.M. EACH DAY.

In connection with the meeting an Excursion to Cambridge will take place on Friday, June 14.

THE BENEVOLENT FUND.

The Annual Meeting of the Contributors to the Benevolent Fund will be held on Wednesday, the 12th of June, at 10.30 a.m.

WALTER T. DUNN,
Secretary.

39, *Victoria Street, Westminster, S.W.*
May 25, 1912.

AMMONIACAL Liquor wanted. Chance and Hunt, Ltd., Chemical Manufacturers, Oldbury, Worcs.
Telegrams: "Chemicals."

HYDRATED OXIDE OF IRON.

PREPARED from Pure Iron.
Twice as rich as Bog Ore.
Gives no back Pressure.
The Cheapest in the Market.
Read Holliday and Sons, Ltd., Huddersfield.

J. E. C. LORD, Ship Canal Tar-Works, Weaste, Manchester. Pitch, Creosote, Benzols, Toluol, Naphtha, Pyridine, all kinds of Cresylic Acid, Carbolic Acid, Sulphate of Ammonia, &c.

PATENTS AND TRADE MARKS PUBLICATIONS: "MERCHANDISE MARKS ACT, and Decisions thereunder," 1s.; "TRADE SECRETS v. PATENTS," 6d.; "DOCTRINE of EQUIVALENTS, Mechanical and Chemical," 6d.; "SUBJECT-MATTER of PATENTS," 6d.
MEWBURN, ELLIS, & PRYOR, Chartered Patent Agents, 70 & 72, Chancery Lane, London, W.C. Telegrams: "Patent London." Telephone: No. 243 Holborn.

TAR WANTED.

THE Burnden Tar Company (Bolton), Ltd.,
Hulton Chemical Works, BOLTON.
Joseph A. Hutchison, Managing Director.

SULPHATE OF AMMONIA SATURATORS and all LEAD and TIMBER WORK in Connection with Sulphate Plants.
We guarantee promptness with efficiency for Repairs.
Joseph Taylor and Co., Central Plumbing Works, Bolton.
Telegrams: "Saturators Bolton." Telephone 0848.

SULPHATE of Ammonia Plant made or repaired. Workmanship Guaranteed for Quality or Dispatch. Own Tools and Plant. Chambers, Towers, Saturators, Tanks, and General Chemical Works Plumber, Distance no object. Best References.
Address, Leadburner, 15, Martin Street, Stratford, E.

RUTHIN GAS AND WATER COMPANIES.

APPLICANTS for the Post of Working MANAGER for the above Companies are THANKED and Informed that the VACANCY IS NOW FILLED.

W. Ewart Brock,
Manager and Secretary.

OWING to the recent Amalgamation of the Chigwell, Loughton, and Woodford Gas Company (with the Gaslight and Coke Company) the late ENGINEER, MANAGER and SECRETARY, desires Employment. References and Details of Past Work gladly supplied.
F. Smallbone, Claremont Grove, Woodford Green, Essex.

REQUIRED by Young Man (Age 26), wishing to Improve his Position; a Situation as RENTAL COLLECTOR, WAGES CLERK, or GENERAL CLERK to a Gas Company. Ten Years' Experience. Good References.
Address No. 5579, care of Mr. King, 11, Bolt Court, Fleet Street, E.C.

WANTED, an Assistant Works Mana- GER in the Midlands, for a Structural Steel Works, with Foundry, Fittings, and Pattern Shops, employing about 600 Hands. Must be energetic, have good Organizing Abilities on Systematic Lines, well versed in up-to-date Practices, and able to Assist in Fixing Works Prices for estimating.
Apply, by letter, stating Age, Salary required, and References (in Confidence), to No. 5569, care of Mr. King, 11, Bolt Court, Fleet Street, E.C.

WANTED, a General Foreman in a Suburban Gas-Works with a make of over 200 Millions. Applicants must have Experience of Regenerator Settings, Electrical Stoking Machinery, Carburetted Water Gas, and the General Routine of a Gas-Works, and be a Good Controller of Workmen. Wages according to Experience. Free House, Coal, and Gas.
Apply, by letter, to No. 5575, care of Mr. King, 11, Bolt Court, Fleet Street, E.C.

WANTED, by a Gas Company in South- East England, a Young Man of Good Address as CANVASSER. He must have Good Experience in Modern and Up-to-Date Gas Lighting, Heating, and Cooking, and be able to Explain to, and Converse with, Consumers, or Prospective Consumers, on the Methods and all matters concerning same.
Apply, in first instance, stating Age, previous Experience, and Salary required, accompanied by Three Testimonials (*copies* only) or References, to No. 5580, care of Mr. King, 11, Bolt Court, Fleet Street, E.C.

WANTED, an Engineer for a Gas Works in Australia. Must be well-up in High-Pressure Gas, and have Knowledge of the different Vertical Retort Systems. The annual production of the Gas Company is about 100 Million Cubic Feet.
Apply, by letter, stating Age, Experience, and Salary required, to No. 5578, care of Mr. King, 11, Bolt Court, Fleet Street, E.C.

TWELVE-INCH Four-Way Valves (by Cockeys), Offers Invited for Two, Second-hand, Twelve Years old, in good order, removed during Extensions.
E. H. Millard, Engineer and Manager, Cowes Urban District Council, Gas Department.

FOR SALE—The Brighouse Corpora- tion have the following PLANT FOR SALE:—
Two 18 ft. by 16 ft. by 5 ft. PURIFIERS, complete with Lifting Apparatus and two 10-inch Four-Way Valves and Connections, with Girder Floor and Cast-Iron Columns.
One Braddock 40,000 Cubic Feet per hour square type STATION METER, complete with Valves and Connections.
Inspection by arrangement with
Harold Davies,
Engineer and Manager.
Gas-Works, Mill Lane,
Brighouse, May 13, 1912.

FOR SALE—A large quantity of Second-Hand LAMP COLUMNS (Newton, Chambers, No. 60 Pattern), also a quantity of 14-inch COPPER LANTERNS suitable for Flat-Flame Street Lighting.
For Particulars and Price, Apply to the Barnsley Gas Company.

CAMBRIDGE UNIVERSITY AND TOWN GASLIGHT COMPANY.

THE above Company have for Dis- posal Two Sets of Three PURIFIERS, 20 ft. by 10 ft. by 4 ft. deep inside, with Two Centre Valves, 14-inch Connections and Lifting Apparatus Complete. Also one "Standard" WASHER, with ENGINE and 14-inch Connections, and three TOWER SCRUBBERS, 28 ft. 6 in. high by 7 ft. internal diameter.
All in Good Condition.
J. W. Auchterlonie,
Engineer and Manager.
May 6, 1912.

GREAT WESTERN RAILWAY.

THE Directors of this Company are prepared to receive TENDERS for the PURCHASE of Second-hand GAS-WORKS FITTINGS at their Worcester Coal-Gas Works, comprising:—
Three Benches of Two Beds of Six RETORTS each.
CONDENSERS.
SCRUBBER.
Horizontal ENGINE and EXHAUSTERS.
TAR and LIQUOR PUMPS.
Ditto TANKS.
PURIFIERS (Five).
HOLDERS.
FITTINGS, MAINS, &c.
Forms of Tender (upon which alone Tenders will be received) may be obtained upon Application to the Company's Locomotive Superintendent at Swindon, to whom Inquiries and Applications to Inspect the Plant should be addressed.
Tenders, addressed to the undersigned and marked outside "Tender for Gas-Works Fittings," will be received not later than Ten a.m. on Tuesday, the 11th of June, 1912.
The Directors do not bind themselves to accept the highest or any Tender.
A. E. Bolter,
Secretary.
Paddington Station,
London, W., May 23, 1912.